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original Edition

AN
ESSAY
ABOUT THE
ORIGINE & VIRTUES
OF
GEMS.

Wherein are Propos'd and Historically Illustrated some Conjectures about the Consistence of the Matter of *Precious Stones*, and the Subjects wherein their chiefest Virtues reside.

By the Honourable ROBERT BOYLE, Esq;
Fellow of the ROYAL SOCIETY.

16
LONDON,
Printed by William Godbid, and are to
be sold by Moses Pitt at the White
Hart in Little Britain, 1672.

B 1760.0

Supplementary

3/03

THE
PUBLISHER
TO THE
READER.

The Philosophy and Ori-
gine of Gems as well as
theire Usefulness and Vir-
tues will, I am perswaded be
found, upon the attentive per-
usal of this *Essay* it self, so ra-
tionally and warily deliver'd
therein, that there will need
nothing to be said in the praise
of the Composure thereof. I
dare venture, notwithstanding

A 2 the

The Publisher

the Noble Author's modesty, to present it to the most Critical taste, without hanging out a Bush to it.

All I have to say in the publishing thereof, shall be the same, that was alledged by the English Interpreter of the Learned *Steno's Prodromus* to an intended *Dissertation* of his, concerning Solids naturally contained within Solids, printed the last year by *Moses Pitt* in *Little Britain*; where in the *English* Preface occur passages to this effect, *viz.*

“ That the Honourable Author of this *Essay*, before he would see or hear any thing of that *Prodromus* of *Steno*, did upon occasion solemnly declare

to the Reader.

“ declare to the Author of that
“ English Version (who there
“ protests , that he speaks it
“ *bona fide* ,) the sum and sub-
“ stance of what is deduced
“ at large in this Tract ; the
“ Manuscript whereof the said
“ Interpreter then saw , and re-
“ ceived it into his custody
“ for publication : Which Sum
“ was this ; *First* , that the ge-
“ nerality of *Transparent* Gems
“ have been once Liquid Sub-
“ stances , and many of them ,
“ whilst they were either fluid ,
“ or at least soft , have been im-
“ bued with Mineral Tinctures ,
“ that con-coagulated with them ;
“ whence he conceives , that di-
“ vers of the real Qualities and
“ Virtues of Gems may be proba-
“ bly derived . A 3 Se-

The Publisher

“ Secondly, as for the Opacious
“ Gems, and other Medical
“ Stones, as *Blood-stones*, *Jaspers*,
“ *Magnets*, *Emery*, &c. he esteems
“ them to have, for the most
“ part, been Earth (perhaps in
“ some cases very much diluted
“ and soft) impregnated with
“ the more copious proportion
“ of fine Metalline or other Mi-
“ neral juices or particles; all
“ which were afterwards reduced
“ into the form of Stone by the
“ supervenience (or the exalted
“ action) of some already inex-
“ istent petrescent Liquor or pe-
“ trific Spirit, which he supposeth
“ may sometimes ascend in the
“ form of Steams; from whence
“ may be probably deduced not
“ only divers of the Medical Vir-
“ tues

to the Reader.

“tues of such Stones, but some
“of their other qualities, as Co-
“lour, Weight, &c. and also ex-
“plained, how it may happen,
“what he hath (which he doubts
“not but others have done also)
“observ’d of Stones of another
“kind, or Marchasites, or even
“Vegetable and Animal sub-
“stances, that have been found
“inclosed in solid Stones; for as
“much as these substances may
“easily be conceived to have
“been lodged in the Earth, whilst
“it was but Mineral Earth or
“Mud, and afterwards to have
“been, as ’twere, cased up by the
“supervenient petrific Agents
“that pervaded it.

“Nor are these petrescent
“Liquors the only ones, to

A 4 which

The Publisher, &c.

“ which he supposes that many
“ Fossils may owe their Origine
“ since he thinks, there may be
“ both *Metallescent* and *Mineral-
lescent* Juices in the bowels of
“ the Earth, and that sometimes
“ they may there exist and ope-
“ rate under the same Spirits and
“ Steams.

So far the *Preface* to that
Translation; which is here re-
peated, to do right to this Noble
Author, in the matter of the
Theory relating to the Origine
both of precious and other
Stones. Which done, I shall keep
the Curious Reader no longer
from the Contentment, which he
will doubtless find in the perusal
of this *Essay*.

THE



THE P R E F A C E.

THAT the Scarcity, the Lustre and the Preciousness of Gems have made them in all ages to be reckon'd among the finest and choicest of Natures Productions, is generally granted. But whether the Books, that have been divulged of them, be answerable to the Nobleness of the Subject, seems not to me so unquestionable: For, as for the Origine of Gems; to say with Aristotle towards the close of his third Book of Meteors, that a dry Exhalation, ἐνεργεία φωτιῶν, (whether) fiery or firing, (ενπυρία,) makes, among other fossils, the several kinds of unsusible stones: or to tell us, according to the more received Doctrine, that Gems are made of Earth and

The Preface.

and Water finely incorporated & harden'd by cold ; This, I say, is to put us off with too remote and indefinite generalities, and to found an explication upon Principles, which are partly precarious and partly insufficient, and perhaps also untrue. And as to the History of Gems, that has been so fabulously deliver'd, that especially among the Moderns, many learned men, Philosophers and Physicians, have, for the sake of so many improbable and sometimes impossible Virtues, that have been ascrib'd to Gems, been induc'd to deny them any Virtues at all. 'Tis true, that I am not altogether so severe, and that the esteem, that I find made by Learned men of the inquisitive Emperor Rudolfus's Physician Boetius de Boot, makes me discriminate him and two or three modern Authors, that in Books, professedly made on other Subjects, have written incidentally of some Gems, from such notoriously fabulous Writers as Mizaldus, Albertus Magnus, (if his name be not injur'd by the imputation of a spurious Book) Baptista Porta, Kirannides (and some others that I forbear to name,) from whose Learning one would

The Preface.

would expect more wariness and Judge-
ment. But though, for reasons elsewhere
mention'd, I do not unreservedly think,
that Pretious Stones, especially Opaous
ones, can have no medical Virtues at all;
yet when I consider'd, how difficult it
was to assigne any thing that is possible and
intelligible, (which I do not take a sub-
stantial form to be,) whence their Virtues
may probably be derived, without giving
some such account of the Origine of Gems
themselves, as was not to be expected
from the Followers of the Peripatetic,
that is, the Received, Philosophy; I could
not but wish, that something were attempt-
ed on that Subject according to the Prin-
ciples of the Corpuscularian.

These things made me the less back-
ward to comply with the Curiosity of my
Friends, which put me upon the following
Discourse, wherein I was content to try,
what, without ransacking the Authors that
had professedly written de Gemmis, the
consideration of the Subject to be treated
of, my natural propensity to take notice of
Natures productions, and the tryals where-
to these Considerations and Observations
lead

The Preface.

lead me, would suggest to my Pen.

Whether my Conjectures and Ratiocinations be as new to others as to those I chiefly wrote for, 'tis not my part to determine: Only I design'd to suit my Discourse to the Phænomena of Nature, without being sollicitous with whom I disagree'd or complyed. And therefore, though it should happen, that some Conjectures of mine should, unknown to me, be coincident with the opinion of some Classic Writer about Gems; yet I presume, the whole subsequent Hypothesis and the Arguments 'tis founded upon, will appear to have been suggested to me by the nature of the thing it self, and my way of considering it: not to mention, that sometimes one may meet with a good particular Conjecture in an Author, that understands not the importance of it himself, and knows not how to make use of it, but builds it on some such fabulous Relation or erroneous Principle, as is apt to discredit it with wary Readers, unless they be such, to whom its compliance with the Opinions, they have on better grounds already entertain'd, happen to recommend

The Preface.

recommend it. I know, it may be thought strange, that I have been so very sparing in the Citation of those Authors, that have writ whole Books about Gems; but I have this to say for my self, that I had neither them, nor so much as my owne Papers about the Origine of Minerals at hand, when I writ the following Essay. Which I was the less troubled at upon two distinct accounts; the first, because I remember'd, that several passages, that I had met with about the Virtues of Gems, cited out of divers of those Authors, were such as I should have much scrupled to vouch; some of them being such as I knew to be false; others, that I shrewdly suspected not to be true; and others, that appear'd to me altogether incredible: And the second, because, to forbear transcribing, what my Friends might probably have met with in Authors already, would best comply, both with their Desires, which was to know my particular thoughts; and with my design, which was partly to see, how far I could make out those thoughts by my own Arguments and Observations, assisted only by some very few historical passages,

The Preface.

passages, that I lighted on in Writers not
Classic; and partly, to take this occasion
to prosecute divers matters of Fact rela-
ting to the subject I was treating of, which
probably would otherwise have been quite
lost. And I doubted not, but if this first
draught of my Conceptions were by my
Friends thought worthy of being inlar-
ged, it would not be difficult for me,
when I should come at my Books and
Papers again, to enrich this Tract with
many Histories borrow'd from famous
Writers; if that should be thought ne-
cessary by persons, that were possibly less
diffident of me than of them. In short;
I propos'd this Discourse but as a Con-
jectural Hypothesis, wherein I at-
tempted to derive the Origine of Gems
and one of the main Causes, (I do not
say, the only Cause) of their Quali-
ties and Virtues, from Principles less re-
mote, and more intelligible than those of
the Peripateticks; and having deliver'd
divers Observations and Experiments of
my own about the Phænomena of Gems,
to explicate some of them by intelligible
Principles, and illustrate others by resem-
bling

The Preface:

bling things that may be really observ'd in nature or easily perform'd by Art. Which way of handling my Subject permitted me to hope, that, whether or no I should be thought a lucky Conjecturer about the Subject I attempted, I should, at least in some measure, prove a Benefactor to what is perhaps preferable even to lucky Conjectures themselves, the Natural and Experimental History of such Noble Subjects as G E M S.

E R R A T A.

PAge 31. line 3. read most of Gems, p. 53. l. 7. r. yet I shall, p. 108. l. 20. r. fented Steams, p. 146. l. 18. r. in close Vessels, p. 168. l. 18. r. Observation, to which some, p. 164. l. 8. r. in Air and Water, p. 172. l. 2. r. of kin to Metals, p. 178. l. 8. r. haemorrhagy, p. 179. l. 17. r. moistened, p. 180. l. 8. r. Bolus's.

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A N E S S A Y
A B O U T
The ORIGINE and VIRTUES
O F
G E M S.

S E C T. I.

Though it will not perchance prove very difficult to propose to you my Conjecture about the Causes of the *Vertues of Precious Stones*; yet I fear it will not be easy for me to acquaint you fully with the Grounds of it. For unless I should transcribe for you my whole Discourse of the *Origine of Minerals in General* (of which you know stones make a part) I cannot well lay

B before

2 An Essay about the Origine

before you all the Considerations, by which I have been induc'd to take up the Conjecture or *Hypothesis* I am about to propound: and consequently I cannot well comply with your curiosity about *Gems*, without either omitting several things which might much countenance the following Discourse, or proposing (without amply proving them,) some things, that I confess seem not clear, nor some of them so much as probable, by their own Light. But since you will have it so; I will, rather than disobey you, present you in one Discourse several things concerning *Gems*, whereof some belong to others of my little Tracts about the *Origine* of *Minerals* from *Fluid* or at least *Soft Bodies*; thô some indeed were more directly written concerning *Gems*: notwithstanding that they were deliver'd not as an entire Tract about that subject, but as Corollaries that might be drawn from, and applications that might be made of, what had been in a more general way discours'd about the origination of *Stones* and other *Minerals*.

And

and Virtues of GEMS. 3

And therefore presuming that you will suppose with me in this Discourse some few particulars, that, I think, I have elsewhere made probable, and might perhaps do so from some of the *Phænomena* mentioned in this Writing it self, I would immediately address my self to the subject of it, if I did not think a previous Admonition very requisite.

For, I must at the very entrance of this Discourse desire you to take notice, that when I propose my Conjectures about the *Virtues of Gems*, I do not suppose the truth of all, or so much as the tenth part of those wonderful properties, that Men have been pleased to ascribe to them: For not only some of the Writers of Natural Magick, but men of note, who should be more cautious and sober, have delivered in their Writings many things concerning *Gems*, which are so unfit to be credited, and some of them perhaps so impossible to be true, that I hope the Believers of them will among the Votaries to Philosophy be as great rarities, as *Gems* themselves are among *stones*. And those

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that can admit such unlikely Fables, will be as much despis'd by the Judicio-
ous, as Jewels can be priz'd by the Rich.

For my part, I never saw any great
feats perform'd by those hard and costly
Stones, (as *Diamonds, Rubies, Saphires,*)
that are wont to be worn in Rings. But
yet because Physitians have for so many
Ages thought fit to receive the frag-
ments of pretious Stones into some of
their most celebrated cordial Composi-
tions ; because also divers eminent Men
of that profession, some of them fa-
mous Writers, and some *Virtuosi* of my
own acquaintance, have by their Wri-
tings, or by word of Mouth, inform'd
me of very considerable effects of some
Gems, (especially *Christal,*) upon their
own particular Observations : And
lastly, because that (as I shall shew a-
non,) I find no impossibility that at least
some costly and less hard, (though in-
deed more valuable) *Gems*, may have
considerable operations upon humane
Bodies, some few of which I have had
opportunity to be conyinc'd of, I will
not

not indiscriminately reject all the Medicinal Virtues, that Tradition and the Writers about pretious Stones have ascribed to those Noble Minerals : Contenting my self to declare in a word, that suspecting most of them to be fabulous, my Conjectures aim only at giving one of the Causes of those Virtues ascrib'd to *Gems* which Experience warrants to be *real* and *true*.

Having thus explain'd in what sense my Conjecture about the Virtues of pretious Stones is to be understood ; it follows that I propose the Conjecture or *Hypothesis* it self ; the substance of which may be compriz'd in these *Two* particulars : First, That many of these Gems, and Medical Stones, either were once *fluid* Bodies, as the Transparent ones ; or in part made up of such substances as were once *fluid* : And secondly, That many of the real Virtues of such Stones may be probably deriv'd from the *mixture* of *Metalline* and other Mineral substances, which (though unsuspectedly,) are usually incorporated with them : And the *Greatness* of the

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Variety and Efficacy of those Virtues may be attributed to some happy Concurrent Circumstances of that Commixture. The *first* of these heads relates properly to the *Origine of Gems*. The *second*, partly to that, and partly to the *kinds and degrees* of their Virtues.

But that any Gems, especially the hardest sorts of them, should have a later Begining, then that of the Earth it self, will probably be thought to relish of a *Paradox*; and I doubt not, it will pass with many for a great one, that some of these hardest of solid Bodies should have been once fluid ones or Liquors: Wherefore I shall endeavour to Countenance this *Hypothesis* by the following Considerations.

I. And first the Diaphaneity of Diamonds, Rubies, Saphires, and many other Gems agrees very well with this Conjecture, and thereby seems to favour it. For 'tis not so likely, that Bodies that were never fluid should have that arrangement of their Constituent parts, that is requisite to transparency, as those that were once in a Liquid Form

Form, during which it was easie for the Beams of Light to make themselves passages every way, and dispose the solid Corpuscles after the manner requisite to the Constitution of a transparent Body. Therefore we see, that *Silver* in *Aqua Fortis*, or *Lead* in *Spirit of Vineager*, having by that solution had their particles reduc'd into a fluid Form, those particles, though before Opacous, are so dispos'd of as to make not only a Dia-phanois solution, but, if one pleases, transparent Christals. And what Chymists usually try with those Metals, I have had the Curiosity to try with several Stones, which I may hereafter have occasion to name to you. But this Argument I bring rather to confirm than evince my Conjecture.

Secondly, The Origine assign'd to Gems may be also countenanc'd by the *External figuratiōn* of divers of them. For we plainly see, that the Corpuscles of Nitre, Allom, Vitriol, and even Common Salt, being suffer'd to coagulate in the Liquors they swam in before, will convene into Christals of curious

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and determinate shapes. And the like I have try'd in several metalline Bodies dissolv'd in several Menstruums. But unless a Concreting stone, or other like Body be either surrounded with, or in good part contiguous to a Fluid, 'tis not easie to conceive how it should acquire a Curious Angular and determinate shape. For Con crescent Bodies, as I may so speak, if they have not room enough in an Ambient Fluid for the most congruous ranging of their parts, cannot cast themselves into fine and Regular shapes, such as I shall presently show that divers Gems seems to affect; but the Matter they consist of must conform to the Figures of the Cavity that contains it, and which in this case has not so much the Nature of a Womb, as of a Mold. And so we see that Salt-Petre, and divers other Salts, if the Water, they were dissolv'd in, be much too far boyld away before they are suffer'd to shoot, will, if the Liquor fill the Glass, sometimes coagulate into a Mass, fashion'd like the inside of the containing Vessel, or if a pretty quantity of Liquor

Liquor remains after the coagulation, that part of the nitrous Mass, that was reduc'd to be concreted next the Glass, will have the shape of the Internal surface of it, whatever that be; but those Christals that are contiguous to the remaining Liquor, having a Fluid Ambient to shoot in, will have those parts of their Bodies, that are contiguous to the Liquor, curiously form'd into such Prismatical shapes as are proper to Nitre.

To apply this now to Gems; That divers kinds of them have Geometrical and determinate shapes, though it be not vulgarly observ'd, because we are wont to see them when they are cut, if not also set in Rings and Jewels; yet I have often had the opportunity to take notice of it, by having had the curiosity to look upon many of them rough as Nature has produc'd them, and the good fortune to take divers of them out of their Wombs. For I remember, I have taken a good number of *Indian Granats* out of a Lump of heterogeneous Matter, whose distinct Cavities like so many Cells

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Cells, contained stones, on some of whose surfaces you might see Triangles, Parallelograms, &c. And being once near the Rock, whence those Stones are chiefly fetch'd that are commonly call'd *Bristol-stones*, I remember, I rid thither and procur'd a Workman or two to dig me up a Number of them, divers of which I found to be curiously and determinately shap'd, much like some Christals of Nitre that I have taken pleasure to compare with them. And the like figuration I have also observ'd in divers *Cornish Diamonds*, and in a fair and large one, which one that knew not what it was, found growing with many lesser in *Ireland*, and presented me. And to let you see, that 'tis not only in these softer Gems that this curious figuration is to be met with, I shall add, that I found among many Stones, I had and took to be *Rubies* (and those the *Jewellers* will tell you are exceeding hard) a considerable number, whose shapes, though not the same with those of the *Cornish* and *Irish* Stones, were yet fine and Geometrical. And the

the like I have observed even in those hardest of Bodies, *Diamonds* themselves; of which rememb'reng that in my Collection of Minerals I had a pretty large one that was rough, I perceiv'd that the Surface of it consisteth of several Triangular Planes, which were not exactly flat, but had as it were smaller Triangles within them, that for the most part met at a point, and did seem to constitute, as it were, a very obtuse solid Angle: Incourag'd by this, I examin'd several other rough Diamonds, and found the most of them to have Angular and determinate shapes, not unlike that newly mention'd. And having thereupon consulted an expert Jeweller, that was also a Traveller, though he could not name to me the shapes of the un-cut Diamonds, he had met with; yet he told me, he generally found them to be shap'd like that I shew'd him; insomuch that such a shape was a mark, by which he usually judg'd a Stone to be a right Diamond, if he had not the opportunity to examine it by the hardness.

And

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And this I shall add in favour of the Comparison, I lately intimated betwixt the coagulation of *Petre* and that of *Gems*, that having once made an odd Menstruum, wherein I was able to dissolve some pretious stones, there shot in the liquor, Christals pretty large, and so transparent and well shap'd, that they might well have pass'd for Christals of Nitre; and yet, if I much misremember not, they were insipid. And I have divers times taken notice in such stones, as the Bristol Diamonds, That though that part, which may be look'd upon as the upper part of the stone, were curiously shap'd, having six smooth sides, which at the top were as it were cut off sloping so as to make six triangles, that terminated like those of a *Pyramid* in a *Vertex*; yet that which may be look'd upon as the root or lower part of the stone, was much less transparent (if not opacous) and devoid of any regular figuration; of which the reason seems to be, that this being the part whereby the stone adher'd to its womb, it was fully'd by the

the muddiness of it, and reduc'd to conform it self to whatever shape the contiguous part of the Cavity chanc'd to be of; whereasthe upper part of the stone was not only form'd of the clearer part of the Lapidescent Juice before the waterish vehicle was exhal'd, but had room and opportunity to shoot into the curious figure belonging to its Nature. And this is much more conspicuous, where many of these Christals grow as it were in Clusters out of one Mineral Cake or Lump; as I have seen not only in those soft but yet transparent Concretions, which some of the later Mineralists (for the ancient seem scarce to have known them) call *fluores*, and particularly in a very fine mineral lump, that I had once the honour to have shew'd me by a great Prince, and no less great a Virtuoso, to whom it was then newly presented. For this mass consisted of two flat Parallel Cakes, that seem'd compos'd of a dirty kind of Cristalline substance, and out of each Cake there grew towards the other a great Number of stones, some of which by their cohæ-

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cohæsion kept the two cakes together, and most of these stones, having each of them a little void space about it, wherein it had room to shoot regularly, were Geometrically shap'd, and, which look'd very prettily, were colour'd like a (German) Amethyst. And I have my self a pretty large stone, taken up here in *England* by a Gentleman of my Acquaintance, which consists (as it were) of four parts: The lowermost is a thin and broad flake of coarse stone, only adorn'd here and there with very minute glistering particles, as if they were, (as probably they may be) of a Metalline Nature; over this is spread another thin white, but opacious, bed, which is so inclos'd between the first nam'd bed, and the two others, that without defacing the stone I cannot well examine it: The third consists of a congeries of minute Cristals exceedingly thick set, which therefore look whitish, having little or no tincture of their own; and this part no more then either of the former, is not much thicker than a Barly Corn. The fourth and uppermost

most part, which yet seems in great part to be the same Christals, which as they grow higher and spread, acquire a deeper colour, is made up of a great Number of *Amethysts*, some paler, and some highly tinted, which are of very differing figures, and bignesses, according (as one may gheſſ) as they had conveniency to shoot; *these* at one end of the ſtone lying in a flat bed (as it were) and ſcarce exceeding a Barly Corn in length; whereas *those* at the other end shoot up to a good height into figur'd Cristals, ſome of them as big as the top of my little finger, and those are the moſt deeply colour'd, being alſo of a good hardness, ſince I found that they would eaſily grave lides upon Glafs.

I remember alſo, that going to viſit a famous Quarry, that was not very far from a Spring which had ſomewhat of a petreſcent faculty in it, I cauſ'd divers ſolid pieces of rough and opacous ſtones to be broken, out of hope I had to find in them ſome finer juice coagulated into ſome finer ſubſtances; and accor-

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accordingly I found, that in divers places, the solid and massy stone had cavities in it, within which, all about the sides, there grew Concretions, which by being transparent like Christal, and very curiously shap'd, seem'd to have been some finer Lapidescient juice, that by a kind of percolation through the substance, that grosser stone was made of, had at length arriv'd at those Cavities, and upon the evaporation of the superfluous and aqueous parts, or by their being soak'd up by the neighbouring stone, had opportunity to shoot into these fine Christals, which were so numerous as quite to overlay the sides of the Cavities, as I can show you in some large Clusters of them that I brought from thence. And inquiring of an ancient Digger, whether he had not sometimes met with greater quantity of them? he told me, that he had, and presented me a great Lump or mass made up of a Numerous Congeries of soft Christals, (but nothing so colourless as these other newly mentioned) sticking to one another,

another, but not any of them to any part of the Rock: So that they seem'd to have been hastily coagulated in some cleft or Cavity, as it were in a Mould, where meeting & mingling before Concretion with some loose particles of Clay, the mass may thereby be discolour'd.

Our Argument drawn from the figure of transparent Stones may be much strengthened by the coalition I have sometimes observed, of two or more of such Stones, and the congruity in the shape of some of them to the *figures* of those parts of the others, that were contiguous to them and seem'd to have been form'd after them. But though this *Phenomenon* be considerable to the scope of my Discourse, yet perceiving that I shall have occasion to insist on it hereafter, I shall not do it now.

Thirdly, Nor is it only the external figure of these Gems, but the internal Texture that favours our Hypothesis; some of them seeming much to imitate in their Coagulation several of those substances, which I have observ'd to

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have once been fluid. That common Salt may be made up of small saline Particles, that by a Convenient Juxta-Position may be associated into great Lumps, divers of which are cubically shap'd, is an observation easie enough to be made. And that such Coalitions of particles may constitute solid and considerably hard Bodyes, I have try'd by breaking some of the larger Cubes of Sal Gem, and the Lumps of the Isle of *Mayo-Salt*, whereof the first is *fossile*, the other *marine*, and both *Natural*. I have likewise found by Tryal, that, though Silver dissolv'd in *Aqua-fortis* appears usually to shoot, if it be taken notice of, into flat and exceeding thin flakes; yet 'tis very possible so to order the coagulation, that many of these thin Plates shall in their Convention have their flat sides so plac'd over one another, as to make up pretty large and thick Christals, whose very outsides will be finely shap'd as being some peculiar kind of *Vitriol*. Nor are these the onely fluid Bodies, which I have reduc'd to coagulate into Conventions, of such a flaky

flaky Texture; wherefore I began to suspect that divers transparent Minerals may have the like; and in some Dia-phanoous kinds of Talk, whose outsides were Mathematically figur'd, I found Encouragement to try, whether ev'n some Gems themselves, notwithstanding their hardness, might not have such an Internal figure. Nor was I deterr'd by considering, that 'tis taken for granted, that Gems are of an uniform Texture, and that there must be a strange thinnes in the Plates that make up transparent stones, since no such thing has been noted by the most curious Eye, but men have taken it for granted, that the Texture of all Gems is Uniform, without any grain or fibres, no more than there is in Gold. But as to the thinness of the Plates, I remember, I have several times taken pleasure to hold a peice of good *Muscovia-glass* against the Light, when it was of such a thinnes, that the spectators, though provok'd to look with curious Eyes, could scarce see the Plate it self, and would by no means be brought to

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think that it was possible to split it, till I did actually do it ; and sometimes I then subdivided it beyond ev'n my own Expectation. But to examine this Conjecture , I took some stones that had Geometrical figures on part of their Surfaces, and which I had other grounds to think to have been once fluid substances, and having diligently surveyed some of them, which seem'd likeliest to give me satisfaction , I manifestly e-nough perceiv'd, not only with my assi-sted, but with my naked Eyes, divers parallel Commissures , which seem'd plainly to be made by the contiguous Edges of little thin Plates of stone , that appear'd to lye one over another , almost like the Leaves of a Book that is a little open'd.

I remember that holding a large and rough Grizolette (as Artificers call hard Gems, of a blewifh colour , brought them from *East India*) against the Light and curiously observing it, I have sometimes plainly discern'd a grain, as they call it, in the Stone, and was answered by a skilful Artist that us'd to make Seals

Seals of them, that such Stones would usually split according to the *Ductus* of their Grain. I will not urge, that in some other Precious Stones, that were cut and Polish'd, as particularly the Hyacinth, and ev'n the Saphire, by obverting them several wayes to the Light, I have been able to observe, as it were, Commissures, which were so fine, as not to hinder, or call in Question the Intireness of the Stone, for the Lapidaries purpose. This I say I forbear insisting on, because the *Phænomenon* is far less considerable than what I have several times observ'd in New English *Granats*, wherein, especially when they are broken, the Edges and Commissures of the thin Plates or Flakes, whereof they consisted, were very easily discernable. And to try whether this observation would hold even in the hardest Stones, I had recourse to a pretty big Diamond unwrought, which being plac'd in a Microscope, shew'd me the Commissures of the Flakes I look'd for, whose Edges were not so exactly dispos'd into a plain, but that some of them

were very sensibly extant like little Ridges, but broad at the Top above the level of the rest. And these Parallel flakes together with their Commissures, I could in a somewhat large Diamond plainly enough discern even with my unassisted Eyes. And for further satisfaction, I went to a couple of Persons, whereof the one was an Eminent Jeweller, and the other an Artificer, whose Trade was to cut and polish Diamonds, and they both assur'd me upon their repeated and constant Experience, and as a known thing in their Art, that 'twas almost Impossible, (though not to break, yet) to *split* Diamonds, or cleave them smoothly cross the Grain, (if I may so speak,) but not very difficult to do it at one stroke with a Steeled Tool, when once they had found out from what part of the Stone, and towards what part the splitting Instrument was to be impell'd: By which 'tis evident that Diamonds themselves have a grain, or a flaky Contexture not unlike the *fissility*, as the Schools call it, in Wood; which you will easily grant

to

to consist of assimilated water or Juices ; which having been once fluid Bodies, were fit to have their Particles so rang'd or dispos'd, as to constitute a Body far more easie to be cleft according to the *Ductus* of the Fibres (or Planes) than otherwise. And I remember that having, as I thought, observ'd in a rough Diamond, which I purposely examin'd, that the Flakes whose Edges were terminated in one plain, were far enough from being parallel to those whose Edges compos'd another plain, (I speak of Physical planes of the same Stone,) I imagin'd that if this Diamond were to be cleft, it would not be smoothly split into two peices, because the Commisures did probably make Angles in the Body of the Stone ; and accordingly I learned of the ancientest of these Diamond Cutters, that sometimes he met with Stones, that eluded all his skill, and would by no means be split like others into two parts, but, before they were cleft quite through, would break in pieces ; which was a defect in the Stone he could not certainly foresee,

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but was fain to learn from the unwel-
come Event.

Fourthly, It seems not unprobable, that the Colours of *divers* Gems (for I do not say of *all*) are *adventitious*, and were imparted to them, either by some colour'd Mineral Juice, or some tinging Mineral exhalation, whil'st the Gem or Medical Stone was either in *Solutis Principiis*, or of a Texture open enough to be penetrable by Mineral Fumes. Which Arguments considerableness makes me hold it unfit to be lightly touched in this place ; though I cannot discourse any thing fully of it in few words, because it not only *suggests* divers observations and other particulars, but *requires* also the mention of some of the chief of them ; which therefore I shall now subjoin.

1. And the first shall be, That many Gems, not to say almost all of them, have been observ'd to be depriv'd of their Colour, if having fallen, or been put into the Fire they have layn too long there : Insomuch that I have found it affirm'd upon the Testimony
of

of the Learned and Experienced *Boetius de Boot*, that all Gems will loose their colour in the Fire except *Bohemian Granats*. How far this may be true I have not had opportunity thoroughly to examine. But I well remember that having purposely expos'd divers Gems to the fire, though that were but moderate, and had a Crucible interpos'd between it and them, some of them seem'd to have their Tincture much impair'd, and others quite destroy'd. But I must be so free as to admonish you, that if these Tryals be not warily made, they may easily impose upon us; especially if we do not consider the nature and cause of Whiteness. For any Diaphanous Body, as far as I have yet observ'd, being divided into a multitude of very minute parts, and consequently acquiring a multitude of distinct superficies's, which do briskly reflect the Light every way outwards, will appear to have a white colour that will be more or less vivid as the particles are more or less numerous, minute, and otherwise fitted to scatter the inci-

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incident Beams of Light ; as you may see by reducing to powder fine *Venice-Glass*, which will be white ; and ev'n red Inck, if so shaken or beaten as to be brought to a froth, consisting of many minute Bubbles, will seem to have put on a whiteness. So that if by too hasty an Ignition, or too hasty a cooling of the fir'd Gems, they come to be flaw'd with innumerable little Cracks, they may be thought to be made white by having their Tincture driven away, when their whiteness really proceeds from the multitude of those little flaws which are singly unperceiv'd ; and the rather, because the Body may still retain its former shape or seeming intireness. To illustrate which, I have sometimes taken pleasure to heat a piece of Christal red hot in a Crucible and then quench it in Cold Water : For ev'n when the parts did not fly or fall asunder, but the Body retain'd its former shape , the multitude of little Cracks that were by this operation produc'd in it, made it quite loose its transparency and appear a White Body. In making which experiment,

periment, the multitude of produc'd flaws may be pretty well discover'd to the incredulous, if, as I have sometimes done, the ignited Chrystal be warily and dextrously quench'd not in Water but in a very deep solution of Cochanee made with Spirit of Wine, in which operation, if it be well performed, (but not otherwise,) enough of the red Particles of the solution will get into the cracks of the Chrystal, to give it a Pleasing Colour.

The other tryals that I have made about the reducing of Whiteness or paleness in bodies, either transparent,

*About Tincture
of Coral.* or even Semi-Diaphanous only, belonging to an other paper, I shall here forbear to mention them, having already said enough for my present purpose, which is not so much to affirm positively, that no Proof at all can be drawn from the operation of fire upon the Colour of Gems, as to make you cautious, what Proofs drawn from thence you admit.

2. Wherefore declining to say any thing

thing more about the *first*, I shall now proceed to the *next* Circumstance, that belongs to our Argument, (which you may think to be more Considerable then the former) namely that the Colours of several Gems, when they are not *destroy'd* by fire, will be *alter'd* thereby; which being a thing that happens to divers fossile Pigments (of which some I employ to tinge Glass,) and other Bodies confessedly Mineral, argues a Commixture of Mineral substances in those Stones whose Colour receives some of the Alterations I speak of; which last words I add, because I would not impose upon you by concealing, that there may be a change of Colour produc'd by the fire without any alteration of the tinging parts as such. For by flawing the heated Gem in very many parts, a degree of whiteness or paleness emerging thereupon may somewhat change the former Colour. But this Alteration being but a kind of Dilution, is not that which I here mean. For I remember I have taken *Indian Granats*, and having in a Cru-

Crucible expos'd them to the fire , I found they had exchang'd their red-dish Colour for a Dark and Dirty one; like that of Iron that has been long kept in the Air. And having taken some pieces of Agate prettily enough adorn'd with waves of differing Colours, and kept them a competent time (for they should not be kept too long) in the fire, I found , as I conjectur'd , that the greatest part of the Agate seem'd to be depriv'd of its Tincture , being reduc'd to a pleasant Whiteness : But in some places where there were stains of a differing kind from the rest, and where there ran little Veins, that I ghesst to be of a Metalline Nature ; there, I say, the Colour was not destroy'd, but chang'd, and the Veins of Pigment thus colour'd acquir'd a deep redness, which they will retain, if let alone ; though I was induc'd to think by some Tryals made on other pieces of *Indian* Agate, that even these Metalline Tinctures were not so fix'd but that a lastinger fire would drive them away, and leave the stones purely white.

Such

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Such a change of Colours as I lately mention'd in the Veins of Agate, is like-
wise found in those of some other Stones, as also in some Pebbles, amongst
divers of which, that lost only their Transparency by Ignition and Extinction
in Water, one or two acquir'd so much deeper a Colour then it had before,
that I thought it remarkable.

3. Another Circumstance that seems to favour our Conjecture may be this, That it has been observed not unfre-
quently, that near many of the places, where colour'd Gems are found, some Mines or Veins of Metals are to be met with. And I think it not unlikely, that if search were skilfully made, many more Discoveries would be made of Veins either of Metalline Oar or some other Mineral, Liquid or Concreted, whence, by way of Juices or Fumes, the Gems may be presum'd to have receiv'd Tinctures. But usually where pretious Stones are found, Mens Indu-
stry and Curiosity is too much confin'd to those rich Minerals, and does not make them solicitous to look after in-
ferior

ferior Ones. Besides, that in *East-India*, whose Countreys are best for the most Gems, they are wonderfully unskillful at digging Mines; as I have gather'd from the Answers of some, who purposely went to visit the Diamond Mines, as they call them. To this may be also referr'd, that Gems are several times found in the Metalline Veins themselves, or very near them: As I can shew you divers Amethysts that an ingenious Gentleman of my Acquaintance took himself out of a piece of Ground abounding with the Ores of Iron and Tin, the latter of which was there plentifully dug up. And in those colder Countryes, such as *Germany* and *England*, where hard Gems are more unfrequent, those soft ones that Mineralists call *Fluores*, are often to be found in or near Metalline Veins, so finely tinted by Mineral Juices, that, were it not for their softness, they might pass at least among most Men, for Emeralds, Rubies, Saphires, &c. as I have been inform'd, not only by some Mineral Writers of good credit, but also by

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by eye witnessses, and partly by my own
Observation.

4. The fourth Circumstance which may be alleag'd to the same purpose with the three foregoing, is, That it seemes possible, from some Gems by Menstruum to obtain Tinctures that seem rather Extractions, than Dissolutions strictly so call'd: I will not urge the Chymical Processes that may be met with in some Authors to this Effect, because some Circumstances in the things and in the Writers, made me so far suspect those I could try, (and those that requir'd undiscover'd Menstruum, as they may be true, so, for ought I know, they may not,) as to keep me from meddling with them. But I remember, I once made a Menstruum, (I say once, because its preparation is so subject to casualty, that I have often fail'd in it) which being pou'd upon well colour'd Granats, not only not calcin'd, but intire, was in no long time beautifi'd with a high and lovely Tincture, which was admit'd by very skilful Persons, to whom I shew'd it, because
the

the Menstruum was not more corrosive than White-Wine ; and which yet I therefore took to be a genuin Tincture, partly because it was drawn in the Cold, partly because the Liquor would not tinge it self by standing, if no Body were put in it, and partly because it drew a Tincture from Antimony of a very differing colour from this we speak of. Nor are Granats the only Gems, which I have made the Liquor work on, in the Cold.

5. To these Four Circumstances I shall add this Fifth ; That some Gems, which Jewellers affirm without scruple to be Rubies, Saphires, &c. either are colourless, or have other colours than those that are wont to belong to them. That famous Gold-Smith, *Benvenuto Cellini*, in his little *Italian* Tract of his

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own Profession, admonishes his Reader, that there are one kind of Rubies, that are Naturally white, (and not made so by Art) which he proves by the degrees of hardness peculiar to Rubies. And the same Author elsewhere tells us of *Berills*, *Topazes*, and *Amethysts*, that are white. And it

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seems,

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seems, by what he says not far from that place, that the *Italian* Jewellers did not look upon the Tinctures of Gems as any thing near so Essential to them, as they are commonly reputed, since they reckon *Topazes* and *Saphires*, whereof one is Blew and the other Yellow, but both extreamly hard in comparison of other Gems than *Diamonds* (and perhaps *Rubies*,) to be of the same species. The Degree of hardness of *Rubies* and *Saphires* is oftentimes so equal, that I knew an expert *English* Jeweller, who for that only Reason (for he knew not whence the difference of *Colours* might proceed) took *Rubies* and *Saphires* to be of the same kind of Stone.

And that Gems, referr'd by Lapidaries to the same kind, may be very differingly ting'd, is a truth, whereof I have seen notable Instances in *Diamonds* themselves; which I therefore prefer to other Instances, because the extream hardness of Diamonds is such as keeps Jewellers from mistaking any other Stone for a true Diamond, if they are permitted to put them on their r-

apidly

pidly mov'd Wheels employ'd to cut them. Now of true Diamonds I have seen some, that were Yellowish, others that were more Yellow, and among the rest, one that was so perfectly Yellow, that I at first took it for a fair Topaz, though it were a Diamond valued at near three pound weight of Gold: I have also seen Diamonds and those rough, as they came directly out of the *Indies*, and were soon after bought by Traders in Diamonds for such, which were either Blewish or Greenish. And I particularly contemplated one Stone, which, if its shape and other things had not convinc'd me of the contrary, was so Green, that I should have taken it for an Emerald.

I remember I had once occasion to buy a considerable number of small *Rubies*, divers of which were very curiously shap'd, and coming to look upon the whole parcel more leisurely than my hast would permit me when I bought it, I found in a great number of other Stones one, and but one, that was devoid of any Colour; but in other

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respects was so like the rest, as invited me to conclude that it would have increas'd their number, but that it was coagulated and harden'd before the Mineral Pigment had ting'd it of the same Colour with the rest. In which guess I was confirm'd, when, having met with a Gentleman, who had been in the chief Places of the *East Indies*, where Rubies are found, and particularly at the River of *Siam*, or *Pegu*, near which he liv'd a good while, and where he frequently saw Rubies taken out of the bottom of the Water, and sometimes took them out himself; I learn'd of him by enquiry, that he had there seen several Stones, each of which was partly a Ruby and partly colourless: And sometimes in the same Stone there would be two portions of one sort, and the third, though lying betwixt them, of another: Which has frequently obliged the Jewellers considerably to lessen the Bulk of such Stones by cutting off the untincted part. And, if my memory do not much deceive me, I saw in a great and curious

Princes

Princes Cabinet, among other rarities, a Ring, in which was set a Stone of a moderate bigness, whereof onely one half, or thereabouts, was well tinted, the other being colourless. In Gems that are less precious, and not so transparent, especially in Agats and in Opacous Gems, I could easily give a multitude of Instances of theifferingly tinted parts of the same entire Stone. And I usually wear in a Ring a small Sardonix that was once a great Princes, wherein there are three Portions one within another, the uppermost, Black, the middlemost of a kind of Chesnut colour, the other of a Blew, almoft like a Turquois, each of which portions is exactly of a fine Oval figure, and each of the two uttermost is thoroughout of a very uniform Breadth as well as colour, and exactly parallel to the other. But twould not be here so proper as twill be hereafter, to multiply Instances of Opacous Gems: Wherefore (having mentioned only the Sardonix, because tis not alwaies Opacous,) I shall add concerning Transparent ones, That

Jewellers reckon among Saphires not only that sort of Azure Gems which usually pass for such, but also another sort of Stones, because of their Saphirine degree of hardness; though for their want of Tincture they call them white (Saphires.)

6. The Sixth and last Circumstance belonging to the foregoing Argument or Consideration is this, That sometimes one may find Gems that are partly tinged and partly not: As if the tinging Pigment mixing with one part of the matter whereof the Stone consisted whilst it was Liquid or soft, were not copious enough to diffuse it self to the Whole, nor to give an equally intense Colour to all that portion that it tinges. 'Tis true that in some cases the Diffusion may be stopp'd by the Petrescent Juices coagulating first in another part than that with which the Tincture was mix'd. And perhaps, in some other Cases, the different Colours may have belonged to differing portions of matter, coagulating upon or against each other, at differing times, yet so as to seem

seem one intire Stone, as I may have hereafter occasion to declare. Yet since, which soever of these explications be admitted, it will, if it belong not to this place, at least confirm our main *Hypothesis* (of the Origine of Gems from fluid or soft materials :) I shall return to what I was saying about Gems, partly tincted and partly colourless. And having onely intimated upon the by, that in some hard Semidiaphanous Stones, *European* and *East Indian*, I have observed a very unequal and irregular diffusion of the Tincture : I shall add to the things, that may be gather'd in favour of the propos'd Conjecture from some of the things before (as also since) related, these two Particulars.

The one, That I have (as I think I elsewhere mentioned) seen in *Italy*, among Rarities, a large piece of Chrystal about the bigness of my two fists, whereof the Pyramidal part was of a Transparent Green, the *Vertex* being richly ting'd like an Emerald ; but the further the colour spred from the *Vertex*, the fainter and paler it grew ; so

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that, before it came neer the Base, it was quite spent, if I may so speak, leaving the bigger part of the Stone transparent, but colourless, like ordinary Christal. And by this perhaps we may explain an Expression of *Josephus Aeosta*, where he sayes, that *Emeralds* grow in Stones like unto Christals, and that he had seen them in the same Stone fashioned like a Vein; *And they seem*, adds he, *by little and little to thicken and refine*. And in the same place this Learned Author has a memorable observation, that may confirm both what I have just now related, and what we mentioned a little above, about colourless Gems: *I have seen*, sayes he, *some that were half White and half Green; others all White, and some Green and very perfect*. And this is the first Particular I was to mention.

The Other is afforded me by the way I have us'd and elsewhere describ'd, of giving to pieces of Rock Christal passably good Tinctures by Mineral Fumes. And supposing the thus colour'd pieces to be as intire Stones as the beholders have

and Virtues of *GEMS.*

have generally believed them, the instance will be pertinent to our purpose in spite of an objection. For though the Colours thus given are not wont to pervade them very deep, and have their penetration assisted by no faint degree of heat ; yet 'tis to be consider'd on the other side, that these pieces of Chrystal had attain'd their full hardness, and after their colouration, are cut and polish'd like other Chrystals : Whereas the Gems that our Conjecture means, are suppos'd to have been ting'd under ground when they were yet fluid, or at least soft. That there are sometimes generated in the Bowels of the Earth Mineral Exhalations capable of applying themselves to the

*Of Subterraneal
Fires, &c.*

Stones they meet with there, I have in another Discourse sufficiently declar'd. That also some hard and stony substances have been actually tinged with such Mineral Steams, I shall, in the subsequent part of this Discourse, have occasion to take notice. And I remember too, that even in so hard a Gem as a Saphire,

Saphire, I have observ'd the efficacy of these Subterraneal Fumes ; having divers times seen one of those Stones, wherein a fine Seal was cut, which continu'd so oddly ting'd notwithstanding what had been taken off to reduce it to an exquisite shape, that having inquir'd of a skilful Person of my acquaintance by whom it had been Ingraven, he both assur'd me that he had found it of the full hardness of a Saphire, and confess'd to me, that the Mineral Fumes had so oddly ting'd it, that in his opinion it might, by the Looks, pass (rather) for a *Chalcedonian*.

And now, Sir, I fear I may need your pardon for having been so prolix in Discoursing of one of the Particulars belonging to our Argument ; to excuse which, I have no other Apology to make, but that I hope what hath been deliver'd, will scarce seem impertinent, and that I might easily have made it more tedious, if, to decline doing so, I had not purposely made some omissions.

Having then said thus much about
our

our *fourth* Consideration, I proceed now to add in the *fifth* place, on the behalf of the Hypothesis hitherto favour'd, an Argument which I presume you will not think inconsiderable; Namely, that Solid Gems may include Heterogeneous matter in them. Several Instances of this sort in opacious Stones, I elsewhere recite upon my own Observation; but in transparent ones they are very great Rarities; and therefore it will not, I presume, be thought strange, if I mention but a few.

First then on this occasion I remember, that a very ingenious and qualify'd Lady, who had accompany'd her Husband in an Embassie to a great Monarch, assur'd me, that she brought thence among several Rich Presents and other Rarities, (some whereof she shew'd me,) a piece of Christal, in the midd'ſt of which there was a drop of Water, which by its motion might be very easily observ'd, especially when the Christal was made to change its posture. And, if my memory deceive me not, I have

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I have in some pieces of Rock-Chrystral taken notice of things that seem to argue, that somewhat or other was intercep^ted within the Body of the Stone.

A curious person, that traded much and was very skilful in *Indian-Gems*, particularly *Grisolets*, which he got from the *Indies*, and whereof he shew'd me the largest I have yet seen, being ask'd by me, whether he had ever found in them any Heterogeneous substance, which something, I had observ'd, made me suspect that some of them might harbour notwithstanding their hardness; he averr'd to me, that among divers rough ones, that were brought from the *Indies*, he had with wonder seen one that was about the bigness of a Filberd, in the Solid substance whereof there was a Cavity with a certain Liquor in it; which by changing the posture of the Stone might be made to move to and fro in the Cavity: And when the drop was settled, it was of the bigness of a round Pearl that he shew'd me, which wanted somewhat of a moderate

derate size for a Neck-lace. And when he had answer'd the Questions I propos'd him to clear my Doubts, he added, that this Rarity made the Stone, which was otherwise of a small Value, priz'd at an hundred Pound. And I have my self seen a monstrous Gem, if I may so call it, and little less a Rarity then the former, that an acquaintance of mine had bought, (as I afterwards learnt,) from this Relatour ; whose Narrative about the *Grisolet*, I think the more Credible, because, that having had the curiosity to break a Stone, that was brought as a Rarity from the *East-Indies*, where Gems are often harbour'd in such Stones, I found in the Solid substance of it (which was so hard as to strike fire like a Flint, and in its little flakes was at least Semediaphanous) a Cavity wherein were coagulated very minute but polish'd and Chryalline Stones, which seem'd to have their points inwards, which argued, that there had been some Liquor, in which these glistering particles had shot, though in process of time the remaining
and

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and incoagulable part of it may have been imbibed by the Ambient Matter if not have escap'd thorough it, by Virtue of some peculiar congruity of it with the Pores of the Stone. Which need not be thought impossible, since experience has assured us, that some solid Stones and even Gems may be (though slowly) penetrated or have their Texture altered by common Water. Nor are these the only Heterogeneous substances I found included in this Stone.

And if, as Amber is reckon'd among Gems, and is sometimes of a greater hardness than one would expect, so I could reckon it among true Stones, 'twere easie for me to borrow thence a great confirmation of what I have been saying; and how ever it will afford me an Illustration of it. For, not to mention many things, of what I elsewhere recite my self to have seen in Amber, I have now by me a fine piece of clear and Solid Amber, (presented me by a Person no less extraordinary than it) in which is included a large intire fly, in shape and size much like a Grass-hop-

per,

per, but variously and curiously colour'd, with his Wings displayed.

To these Observations I shall add only this, That I have had my self, and shewn to others, one of that sort of pale *Amethysts*, that some call white *Amethysts*; which had been cut to be set in a Ring, or turn'd into a Seal; and was like that sort of Gems so hard, that I could readily cut Glass with it; and yet in the Body of this Stone there appear'd to be a considerable number of things that look'd just as if they had been hairs, some of them lying parallel, and others inclining to one another; and having contemplated them as well by Day-light as Candle-light, and in divers positions in reference to the Light and the Eye, some of them seem'd at times to be of a lovely reddish Colour, but reflecting the Light, as if they were well fill'd either with Air or Water: But for the most part they did, as I was saying, seem to be hairs of a Brownish Colour, which made the Stone not a little wonder'd at even by curious and skilful Men. I leave you to judge, Whether

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Whether 'twill be fit here to add, that I have sometimes suspected, that even in Diamonds themselves there may possibly be found intercepted, or mingled with a pure Lapidescent substance, some Particles of Heterogeneous Matter. And that in this suspition I was somewhat confirm'd, as by the odd Clouds I had observ'd in an extraordinary Diamond, and by some Hydrostatical, and other Observations I made about those Stones; (some of which I found heavier than either Chrystal or white Marble,) so by my having purposely demanded of an ancient Cutter of Diamonds of great Practice and Experience, whether he observ'd not a sensible difference of weight among Diamonds of the same place: For to this he reply'd, that he had; especially in those that were cloudy or foul: Insomuch that shewing me a Diamond that seem'd to me to be about the bigness of two ordinary pease or less; he affirmed that he sometimes found in Diamonds of that bigness, about a Carrat (which is by common estimation four Grains) difference in point of weight.

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Sixthly, The last Argument I shall employ to shew, That the Matter of divers Gems may have once been fluid, may be taken from the Proofs you will meet with (in the following part of this Tract) of the Second Member of our Hypothesis. For if it shall appear, that several even of the transparent Gems have metalline or other extraneous Mineral Bodies mingled with them, *per minima*, it will be very agreeable to reason to suppose, that such a mixture was made, when the mingled Bodies were in a fluid form; since, beside that one may well ask, how else the Metalline Corpuscles came to be convey'd into such compact and hard Bodies as Gems, 'tis very easie to conceive, if our Hypothesis be admitted, and very hard otherwise to apprehend, how among Bodies that differ *toto genere*, as Metals and Stones, there should be made mixtures so exquisite as many of these appear to be, partly by the Uniform Coloration of the Gem, and partly by the Diaphaneity retain'd notwithstanding this dispersion of Mineral

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Pigments through the whole Mass ; and in many Instances also by the Curious Figuration that we have lately been discoursing of.

Post-script. To all the foregoing Circumstances, I can now add something, that I met with, since I thought to conclude with the Last of them, and that tends highly to the Confirmation of our Hypothesis. In a Tract that makes part of a small Book freshly Publish'd in French, principally to acquaint Men with the waies of estimating Gems according to the Rates of Modern Jewellers, the Anonymus, but Curious Author, takes occasion, to give us, from the Mouth, as he affirms, of the Famous late Travellers he convers'd with in divers places, (and whose Relations are indeed the recentest I have seen in Print) an account of the Number, and Names of the places, where Diamonds and Rubies are found in the *Indies*, adding some Circumstances and Particularities about the Qualities of the Soil in those places that I have not elsewhere met with. This Author then speaking

of

of the first of those three Diamond-Mines, which he makes to be the only ones in the *East-Indies*, having told us that the Stones are there found some in the ground and some in the Rock, subjoyns, that those that are drawn from the Rock, or the neighbouring parts, have ordinarily a good Water; but for those which are drawn out of the Ground, their Water partakes of the Colour or Soil wherein they are found. So that if the Earth be clean and somewhat Sandy, the Diamonds will be of a good Water; but if it be fat or black, or of another colour, they will have some tincture of it. Nay he immediately annexes, that if there be some black or red Sand among the Earth, the Diamond will also have some grain of it. And elsewhere mentioning the *Second Mine of Diamonds*, which the Natives call *Gems*, he admonishes his Reader, that in this, as in the Mine of *Visapour*, (which is that formerly mention'd) the Stones partake of the Quality of the Soil where

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*Que's il y a quelque
sable noir ou rouge
parmi la terre, le
Diamant aussi en
aura quelque un*
Pag. 9.

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they are found ; so that if that be boggy or moist, the stone will incline to Blackness , and if it be reddish, 'twill have an Eye of that Colour. Elsewhere he tells us , that of late Years there were found in the Kingdom of Golconda store of Diamonds, which were brought to the *Nababe*, or first Minister of State, Page 18. 19. who forbad the making any further search after them, finding not one in the whole number to have a good Water, all of them being Black or Yellow. But by the Page 37. way, whereas this Author affirms it as a clear Truth, that as Gold is the heaviest and most precious of Metals , so Diamonds are the hardest, and heaviest of all Stones, he must excuse me if I declare, that what he asserts agrees not with my experience , who having try'd the weight of an uncut Diamond Hydrostatically , have taken such a course to estimate its specifick Gravity , as I find not to have been yet taken by any other , and which you will easily grant to be more exact than any other of the known wayes can be.

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The Argument that hath detain'd us all this while, comprised so great a variety of Matter, and may, I hope, perform so great a part of my task in this Discourse, that, though I shall not much apologize for having dwelt so long upon it, yet I should think my self obliged to make some amends for my past prolixity by being succinct in the remaining part of this Treatise, and therefore, having left off with an intimated promise to shew more fully, that divers Gems contain Metalline or other Mineral substances in them, I should immediately connect those Arguments to what hath been lately said, but that I think it altogether requisite, to make way for what is to follow, by first taking notice of a main Objection, that may be urged against the Doctrine we have been proposing.

This is taken from the Figuration of some Gems (and especially the Prismatical one of Christal) and seems the more fit to be urg'd against us, because we our selves have, in the Second of the above-recited Arguments, given several

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veral Instances of it. For it seems scarce possible, that so curious a shape should be so Uniformly produc'd in such a multitude of Christals, great and small, unless there were some seminal and plastick power to fashion the matter after so regular and Geometrical a manner.

But he that shall attentively consider, what I elsewhere say concerning 'the Figuration of Salts and of Metal-line and other Magisteries dissolv'd by, and concoagulated with Salts, may be very much assisted to discover the Invalidity of this Objection. But yet, because I confess 'tis very specious, if not important, I am content here to consider it a little more particularly.

To this plausible Objection then, I have two or three things to answer; First, That there is no absurdity to conceive, that if there be a Seminal and plastick power in Mineral Bodies, it may be harboured in Liquid Principles, as well as otherwhere. For we see that the Seed of Animals, which oftentimes,

as in Elephants, Rhinocerots, &c. produces hard and solid Bones, Teeth, and Horns, is at first but a Liquid substance; and the Formative power in some Trees and their Fruits does convert the Alimental Juice into Woods, Shells, and other Bodies very Solid and ponderous.

But Secondly, I elsewhere shew, that ev'n in the Figures of Allom, Vitriol, and other Salts, that are so curiously and Geometrically shap'd, there is no necessity to fly to a distinct Architectonick principle; but that those Bodies themselves may receive their shapes from the Coalition of such singly invisible Corpuscles, as by the Motion of the Fluid, wherein they did swim, and by divers assistant Circumstances, are determin'd to stick together rather in that manner than in another. That this may be apply'd also to other Bodies, I shall need to shew in this place by no other Instance than that of the Salt, that (in this or some other paper) I formerly told you I made

*See the Origine
of Forms and Qua-
lities now publish'd
by the Author.*

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of common Salt, only by the help of
Oyl of Sulphur or of Vitriol and Water.
For though it be manifestly a factitious
Body compounded of Salt and Sulphur,
and such a Body that therein the Sea-
Salt, whereof 'twas chiefly made, has
had its own Nature destroy'd ; yet by
reason of the Figure of the resultant
Corpuscles, and their fitness to convene
when dissolv'd in Water, into curiously
shap'd Bodies, this factitious Salt, when
I have rightly prepar'd it, did sundry
times shoot into long Christals with
points like Diamonds, that did emulate
native Christal as well in the regularness
of the shape, as in the transparency of
the substance. And to make it the
more evident, That 'twas partly the
Figure, that happen'd to result from
the operation of the Oyl of Vitriol up-
on the Sea-Salt, and partly other Cir-
cumstances, that determin'd the shape
of the Christals ; I shall add, that usu-
ally, when the Quality or proportion of
the Oyl of Vitriol was other than it
should have been, or an error was
committed in some (important) Circum-
stance

stance or other of the Operation, the Saline Concretions, though they did not shoot at all like Cubes, as the Sea-Salt, which they were made of, would alone have done; yet they did not shoot any thing at all like Rock-Chrystal, as did those formerly mentioned; and for all this did, by reason of the curious Shapes of the Corpuscles, they consisted of, shoot into Christals for the most part finely Figur'd; though sometimes of one shape and sometimes of another. And that you may not have any suspition as if the regular Figure, which Sea-Salt is naturally of, is any way necessary to such figurations, I will add an Experiment that I devis'd to shew, That even out of a petrescent Juice such curiously figur'd Bodies may be made. I took then some Stony *striae*, elsewhere mention'd to have been found in Caves or Grottoes where petrescent Liquors coagulated before they have time to fall down, and having dissolv'd them in Spirit of Verdigrease, I put the clear Solution to evaporate in a Digestive Furnace after the ordinary man-

manner ; by which means , though I made the Experiment more than once , I had rather a coagulated Mass than any thing like Christals. Whereby you may learn the truth of what I was saying, That a Concourse of divers circumstances may be requisite to determine the figuration of consistent Bodies, made out of fluid ones : since here, for want of time for making excursions enough for the Particles to concrete in after the most convenient manner, the Experiment succeeded not : Wherefore it being agreeable to my notions, that some sorts of Bodies may require a longer time to make such a Convention in, than others, I allow'd many daies to another solution of *Stiria* made in the same Menstruum ; after which there shot, as I desir'd, about the sides and bottom of the Glass a number of distinct Christals, long, transparent , and curiously shap'd, most of which, I think, I can yet shew you.

Perhaps 'twill be said , that the pearly Juice, when broken, does oftentimes appear to abound , within , with

with *stiriae* or narrow streaks like those of Antimony, and that I my self observe some Gems to be made up of thin flakes or plates ; which internal figuration seems to be much more difficult to be accounted for without a Plastick Form , than the External.

I will not reply to this, that, for ought I know , divers known Salts would , when broken, appear to be Geometrically figur'd ev'n in the lesser Corpuscles as well as they are evidently so in their entire bulk, if we had eyes quick enough to discern the Shapes of the minuter as well as of the bigger Bodies. And we have great Inducements to think, that whether or no *Cartesius* do rightly make the invisible particles , of which the smallest visible Grains of Sea-Salt are made up, to be long and rigid like sticks ; the minute visible concretions, of which the bigger Grains of Salt consist, are as well as themselves of a Cubical figure ; I will not, I say, insist on this reply, but proceed to alledge, That there are divers Bodies so luckily shap'd, that upon a slow Coalition, they will

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will convene into a multitude of manifest Concretions ; some of which will consist of streaks, and others be made up of Flakes ; as in the Sal-armoniack, commonly sold in the Shops (for I speak not of the native, that is said to come from *Armenia* ,) though it be avowedly a Factitious Body , you may often observe, upon breaking the bigger Masses, great multitudes of streaks, like those we may usually observe in the broken *stiria* of petrifying Water. And I have more than once seen , and also made , artificial Concretions (of whose preparation I elsewhere speak) some of which consisted of Salts alone, and others of Salts and Minerals , as Stones or Antimony, which look very like Talk, being white Bodies, made up of a multitude of very slender streaky Particles lying long-wayes one upon another, as in that Mineral. And as I have taken out of Earth many Concretions, which as they were for the most part outwardly shap'd like *Rhombus's* or Lozenges, were compos'd of a multitude of flat and extreamly thin plates ;

plates ; so I have sometimes taken pleasure to imitate such Concretions by Art. And though a Solution of Silver in purify'd *Aqua Fortis* does usually afford only a great company of small, thin and seemingly simple Flakes, like Scales of Fish, because Men have not any design like ours in procuring the Concretion ; yet having dissolv'd a good quantity of the Metal together, and suffer'd it to shoot leasurely and with due Circumstances, I have obtain'd sundry Christals, which both were Geometrically figur'd without , and consisted of a multitude of exceeding thin Flakes orderly sticking to one another. And I remember, That whilst the Objection , I am answering , was in my thoughts , I pitch'd upon a yet more pregnant Experiment for the clearing of it. For considering, how *Tin-Glass* , though a compact and ponderous Body , does naturally consist of a multitude of shining polish'd Flakes , (which may be easily perceiv'd and distinguish'd by breaking a Lump of it into three or four pieces ;) I found by tryal

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tryal what I expected, That though a mass of this Mineral were beaten to Powder, yet if it were melted and suffer'd to cool of it self, the disposition of the Component Particles would determine them to stick to one another in broad and shining Flakes, whereof many will be incumbent one upon another, and some cross to one another at various Angles, according as the matter happen'd in its several Portions to be diversly refrigerated. And some Factitious Bodies may afford us the like Instances, as I have observ'd in some mixtures of Copper, Iron, and other Minerals; and very conspicuously in good *Regulus Martis stellatus*, whose Internal Configuration may be found by breaking it; by which way I have observ'd with pleasure, That the *Regulus* abounded with flat and shining Flakes of an almost specular Polish.

If it be urg'd, to confirm the former Objection, That some Lapidescent Jades, ev'n of those we mention'd in these Discourses, do concrete even whilst Men are looking on; and yet our Stony

Stiria,

stirræ, often mention'd (which probably may be also hastily Coagulated) have in some places a Streaky and in other places an Angular Configuration of parts; I answer First, That I have seen divers of that kind of Concretions, which as far as the eye took notice of, were made up of parts confusedly jumbled together. And next, That (to consider now those whose Texture is more uniform) I have found by Tryals, that, if there be a due disposition in the component Corpuscles of Bodies to such Configurations, they may be brought to concrete accordingly in a far shorter time, than almost any, that have not try'd, would expect, not to say, believe. Having sometimes for Curiosity's sake warm'd six or seven Ounces of *Aqua Fortis*, glutted with fine Silver, 'till the mixture was all brought into a transparent Liquor; and having then put the clear but strong Glass, that contain'd it, into cold Water, that the Menstruum might be the more hastily Refrigerated, I observ'd, That when once the dissolv'd Metal began to shoot,

the

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the Coagulation into figur'd Christals proceeded so fast, that a naked Eye could see the progress of it. And having sometimes put a quantity of Salt and Snow, or of some other strongly Refrigerating mixture, into a convenient Glass, and wetted the outside with a strong Solution of Sal Armoniack or some Urinous Spirit, though in less than a Minute of an Hour it would be Coagulated; yet the Salt, into which it shot, had usually a curious and determinate Figure according to the Nature of the Liquor that afforded it; as I have often shew'n the Curious.

Perhaps you will say, that these Instances are taken from Saline Bodies, which are for the most part dispos'd to convene in smooth Surfaces, and angular Shapes, and easie enough to be wrought on by the External cold; and it may yet seem strange to Philosophers themselves, what in some Cases must have happen'd, if our Hypothesis be admitted, namely, that external Circumstances and Accidents, such as the Figure of a Mold or Womb, the cold-
ness

ties of the Ambient, &c. should visibly, and sometimes not a little, diversify even the internal figuration of close and solid Minerals and Gems, without excluding all those that are supposed to be of a quicker Concretion.

Wherefore to clear this difficulty, it may not be a miss to subjoin an Experiment, that I devised to shew, that if the Corpuscles of a Body be so shap'd as to be fitted by their coalition, to constitute smooth (and if I may so speak) glossy Planes, though they be variously shuffled and discomposed as to their Pristine order, yet if they be but a little while kept in a state of fluidity, that they may the fitlier place themselves or be placed by other Agents, they will presently be brought to convene into smooth and shining Planes, and the Situation of those Planes, in reference to one another, will be more Uniform and Regular, than almost any one would expect in a Concretion so hastily made; notwithstanding which, their internal contexture will be much diversified by circumstances, as parti-
F cularly

cularly the figure of the Vessel or Mold
wherein the fluid Matter concretes.

Considering then, that (according
to what I noted already) if we break
Tinn-Glass (taken for the *Bismuth* of
the Ancient Mineralists) as 'tis wont to
be sold in Lumps in the Shops , it will
discover a great many smooth and bright
Planes, (larger, or lesser, according to
the bigness of the Lump ;) which
sometimes meet, and sometimes cross
one another at very differing Angles :
considering this (I say) I thought it pro-
bable, that a Body, that had already
been melted, and was apt to convene
into such Planes, not onely would do so
upon another fusion, but might have
the order and bigness of those Planes ,
diversified by the Figure and capa-
city of the Vessel, I should think fit for
my purpose. Wherefore having bea-
ten a sufficient quantity of it to powder,
and, when 'twas well melted, cast it in-
to a good pair of Iron-Molds , whose
Cavity was an Inch in Diameter , we
had a Bullet, which, being warily bro-
ken, did, as we expected , seem to be :

as it were, made up of a Multitude of little shining Planes, so shaped and plac'd, that they seem'd orderly to decrease more and more as they were further and further removed from the Superficies of the Globe; And they were so rank'd, that they seem'd to consist of a multitude of these rows of Planes reaching every way, almost like so many *radious's* of a Sphere from the Centre or middle part, to the Circumference: Whereas if we melt Tinn-Glass in a Crucible and let it cool there, the Matter being taken out and broken, will appear indeed full of smooth Planes, but (as was lately intimated) very irregularly and confusedly associated or plac'd.

I will not now stay to enquire, whether the orderly composition of the Planes in our Bullet (which some curious Persons, that I shew'd it to, look'd on, as a not unpleasant sight,) may be deriv'd from this, that the Matter was coold first on the outside, by the contact of the cold Iron Mold, and the neighborhood of the Ambient Air, and

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that the coagulation being once thus begun, the parts of the remaining fluid, as they happen'd to pass by this already coold Matter, with a motion, which, by reason of their remvoal from the Fire, was now slacken'd, they were easily fastened against the already stable parts, (as may be illustrated by the concretion of dissolv'd Nitre and Allom, both about the injected sticks, and the Grains that first concrete against the sides of the Vessel,) and the refrigeration still reaching further inwards, till it came last of all to the middle of the Globe, that being the remotest part from the refrigerating Agents; the apposition was successively and orderly made, till the whole Matter was concreted. But, (as I was saying) I must not now stay to inquire, whether the figuration of our Bullet may be explain'd after this or some such way: or whether we are not to take in some subtle or all pervading matter, or some other Catholique Agent? For though such points may be well worth discussing, and we may possibly elsewhere say something of them;

them; yet here it may suffice to say, that we have varied the foregoing Tryal by casting Bullets of some other Bodies, (and particularly the simple *Regulus* of Antimony) wherein it succeeded well enough, though the produc'd contexture were not so Uniform as in *Tinn-Glass*. And I also try'd, that having cast melted Sulphur it self into a Globous Body of about five or six Inches in Diameter, and warily broken it, though one would think it an unlikely Mineral to make any other than a confus'd Concretion, it presented me great Fibres almost like little strawes, whose number and (in great part) orderly situation afforded me a much less unfit Instance for my present purpose than one would have lightly expected. But what I came from saying, may servye to make out what I propounded to my self; which having named already I need not here repeat.

But one thing more there is, that may be pertinent on this occasion, namely, That I have broken divers Marchasites of a peculiar sort, that were either of

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a roundish, or of an almost Cylindrical Figure, to observe their internal Structure and Qualifications ; whereupon, I found in more than one of them (for I remember not that I did in all) a great many rowes of little Planes or glistering Corpuscles , reaching from the innermost parts to the External Surface, and in those that were somewhat Cylindrically shap'd on the outside ; these ranks of Gold-colour'd particles in the several Planes of the broken Mineral, seem'd like Semi-Diameters iſhuing out from a row of Physical Points, conceived to be plac'd on an imaginary Line, lying almost like the *Axis* of a *Cylinder* between the opposite ends, (though I do not well remember how near it reach'd to them :) As if the Cavities of the Chalk or Clay, wherein these Marchasites were found, had made the Soil like a Mold, wherein the Matter of the Marchasite being detained whilſt 'twas in a Fluid form , did afterwards concrete much after the manner that the Bullets of Tinn-Glass, *Regulus*, &c. did in our Molds. But the prosecution of this

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Conjecture belongs to another Discourse.

I shall therefore now proceed to a further Answer to the formerly raised Objection: Wherefore as to the exquisite uniformity of Shape, which is so admir'd in Gems, and is thought to demonstrate their being form'd by a Seminal and Geometrizing Principle; though I have, in the Second of the above mention'd Arguments, ascrib'd to them such curious Figures, as argue their having been generated after the way propos'd in our Hypothesis; and though also I willingly allow their shapes to deserve from us a delightful Wonder at the curiousnes of Nature's, (or rather her Author's) Workmanship; yet upon a more attentive surveying of them, I do not find the Uniformity to be near so great as is wont to be imagin'd; but have rather met with such Diversities as agree well with our Hypothesis about their Figuration.

In several transparent Gems, it seem'd manifest enough to me, (as I lately also noted) that the Shape was, in great part,

due to the Figure of the Womb, or Mold, wherein the matter, whilst liquid or soft, happen'd to settle. In some other transparent and well figur'd Gems of the same kind or Denomination, and sometimes growing very near one another, by a diligent Inspection I found a manifest and sometimes very considerable Difference in their shapes, either as to the Number, or the Figures, or the bigness of the Sides or Planes that made up the respective Gems ; or as to two, or all, of these ; comparing these deviating Particulars with what would have been in a Stone of that kind or Denomination, that were perfectly figur'd. This I had opportunity to take notice of, particularly in two sorts of Stones ; the first *Granats*, of which I had a considerable number brought me out of *America* growing in one Lump of Matter ; but in distinct parts of it, and without touching one another : Among which I took notice of a manifest disparity of shape, and so I did in some *African* ones, that were presented me ; as also in others that were *European*, one

of

which, that was of an extraordinarily large size for a figur'd Gem of a transparent kind, (for it weigh'd above *Eleven* Drachms and a half,) I consider'd with a particular attention, and found, that, though it seem'd to have been coagulated in a Fluid *Medium*, and to consist of Twelve Planes, at the concourse of two or three of which it seem'd to have been broken off from the Womb or Root ; yet it was very far from the *Dodecahedron* of Geometricians : For, whereas that consists of Twelve æquilateral and æquiangled *pentagons*, almost all the Planes, that made up our *Granat*, were quadrilateral and very different from what regularly they should have been, not only in magnitude, but in shape : for one of them seem'd to have five Sides, and of the rest, some were most of kinn to a *Rhombus*, others to a *Rhomboeides* ; but the most were but little better figur'd than those that the Geometricians call the *Trapezia*. And thus much for the first sort of Gems whose shapes I observed to be not regular. The Second consists of those

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those Christalline Stones, which they call *Cornish Diamonds*, and which are some of them much harder than the *Bristol Diamonds*, or perhaps than Rock-Cristal it self ; it being easie to write upon Glass with them. Of these Stones having procur'd a good number (many of which I have yet by me,) I took notice, by comparing them heedfully together, that though some of them were Geometrically and curiously shap'd like Rock-Cristal, having each six sides, whereof every two, that were opposite, were throughly like and equal enough to one another ; and though the Stone had a Pyramidal termination, made up by several resembling and curiously figur'd Planes, that terminated in a solid Angle or Apex ; yet the greatest number, by much, of these Titular Diamonds was made up of Stones, far from being so exactly and uniformly shap'd, as those newly describ'd. For though most of them had six long Planes ; yet oftentimes the opposite ones (besides that they were not so parallel to one another, as they should have

have been) were unlike and exceeding unequal ; and those Planes, that went to make up the *Apex*, though a part, they were usually angular ; yet being compar'd to one another, or to the Regular Patterns above mention'd, their Figures, their Bignesses, and their manner of concurring (which was sometimes not in a Point or *Apex*, but in a Line,) was so remote from being uniform, that this great diversity and irregularity agreed far better with our Hypothesis, than with its Rival. And yet in these Stones, the want of room to coagulate freely in, could not with probability be pretended ; for they seem'd to have been form'd separately in a fluid Ambient, save at the bottom, where they were fasten'd to the Rock, as appear'd by an opacious Root, if I may so call it, which still adher'd to most of them. And, if I much misremember not, I have more than once in Diamonds, newly brought from the *Indies*, and some of them very fair ones, observed a great want of Uniformity in the *Area's* of the Superficial Planes, or in their Figures,

or

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or both ; and sometimes too in the very number as well as Situation of their Solid Angles or Corners : about which I hope to recover some Notes. And so I have done with the *first* part of my Answer to the above mention'd Objection ; whereby it may appear , that there is no such regular and constant Uniformity in the Shapes of Gems, but that their Real Likeness may be reconcil'd to our Hypothesis.

But now in the *Second* part of my Answer, I shall endeavour to shew, that the Figuration of Gems may not only *consist with* our Conjectures , but *confirm* them. For, I have more than once taken notice in the *Cornish* Diamonds I have been mentioning, that sometimes a small Stone of the same kind, has made up, as it were, one Body with a greater ; so as that the lesser Stone did not only adhere closely to the other, but was, if I may so speake, Set or Bedded in it. So that when the Separation was made , there remain'd in the greater Stone a Cavity, whose Figure did curiouly answer that of as much of the smaller Stone ,

Stone, as chanc'd to be harbour'd there. And, as sometimes I observ'd, that there was such an adnascency, (if you will pardon the Word,) of a Lesser Stone to a much Greater ; so at other times, I met with the like of a Greater to a much Lesser, with a Cavity in the Lesser, answerable to that part of the Greater that had been lodg'd in it. Which, for ought I know, allows us with high probability to conjecture, that the Stone, to which the other grew, was first form'd and harden'd ; since it retain'd its own shape, and that, whilst this remain'd adherent to the Rock or Soil, some more Liquor, either that came afterwards by chance into the same Cavity, or (in case 'twere there before,) that was less dispos'd to an early Concretion, began to coagulate by fastening it self against the Solid Body that was already concreted : Upon which account these two Diamonds must stick close together, and yet be but Contiguous, and a Cavity, such as I freshly mention'd, must be left in the last concreted Gem. Which may be illustrated by putting in-
to

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to a strong solution of pure Nitre , or Rock-Allom, some little sticks of Wood or any solid Body , that may be kept steadily in the same posture ; for you will see many coagulations begin to be made against them, and the Cristals thus concreted will necessarily have their Figures incompleat , and have in them Cavities correspondent to those Parts of the Stick, whereto the Saline Corpuscles fasten'd themselves. To which I shall only add, that though I have given Instances of the adnascency of figur'd Stones only in *Cornish* Diamonds, yet they are not the only transparent Minerals, wherein I have been able to observe it. And particularly I remember , that I observed among some Minerals left by a *Gold-Smith* to his Widow , a Fine transparent and neatly figur'd Stone, which seem'd to be pure Cristal , but was coagulated about a kind of branching Wire, whereof a good part was inclosed by the Stone, that seem'd to grow out of a piece of Ore , that look'd like Silver-Ore, and which the Woman , that was

a curious Person, upon the strict Inquiry that I made, affirm'd to be, together with the above-mention'd branch, good Silver, produc'd by Nature in that form, (which I thought the more credible, because of the odd and almost hairlike shape wherein I have seen Silver-Ore to have as it were grown;) which will excellently agree with the Resemblance, I was just now proposing betwixt the coagulation of dissolved Salts and the liquid matter of Gems, about Stable Bodies partly immers'd in those fluids.

The very many Circumstances belonging to our First Argument, and the last answer'd Objection, have so long detain'd us, that I doubt, you now think it more than time I should advance to, and dispatch the *Second* of those Grand Considerations, whereon I at first intimated our Hypothesis was founded; And this is built upon the *Weight* of some Gems, which being greater than that which seems to belong to them as hard and transparent Stones, I think we may probably derive it from Metal-line or Mineral Mixtures. I

I question not, but as you will think this allegation new, so you will be apt to question, how I come to know the Truth of what I here deliver; since, though Gems are wont to be estimated by Lapidaries, as they weigh such or such a Number of Carrats, or of Grains, yet they compare only the weight of this and that Stone of the same kind in reference to one another, as the greater or lesser weight argues the greater or lesser Bulk, without looking after or knowing how to discover the *Specifick Gravity* of several Gems which depends not on the greater or lesser Bulk; as (if you know it not already) you will gather from what I am now going to relate.

Considering then with my self, that for my purpose, it was requisite to have a Gem as free as I could get from the Metalline Mixtures, that I suspected many pretious Stones to have; and rememb'ring, that Rock-Cristal, as it is by Mineralists reckon'd among Gems, so it is hard enough, as I try'd, both to cut Glass, and to strike fire, and that its having

having so great a transparency, and its being devoid of Colour, makes it exceeding likely to be free from adventitious mixtures; I pitch'd upon it as the Standard whereby to make a *probable* estimate of the weight of Gems; and having Hydrostatically and with a tender Ballance examin'd the weight of it, first in the Air, and then in Water, I found its weight to be to that of Water of equal Bulk as *two* and almost *two thirds to one*: Which, by the way, shews us, how groundlessly many Learned Men, as well Ancient as Modern, make Crystal to be but Ice extraordinarily harden'd by a long and vehement Cold; whereas Ice is bulk for bulk lighter than Water, (and therefore swims upon it) and (to add that Objection against the vulgar error) *Madagascar* and other Countreys in the Torrid Zone abound with Crystal.

Having thus found the Ponderousness of Crystal in reference to Water, when I met with a colour'd Gem, whose Specifick Gravity I gheff'd to be sensibly greater; I sometimes gave my self

the trouble (for a trouble 'tis) to weigh them in the Air and in the Water, and so discover, whether I conjectur'd aright. And if its Specifick Gravity did much exceed that of Cristal, I thought it a probable Argument, that there might be some Metalline or Mineral Corpuscles mingled with the stony Ones of the Gems, and that also it may probably derive its Tincture thence. I will not tell you, that I then found many sorts of transparent Stones *much heavier* than Cristal: For, besides that the Tryals were troublesome enough to make, I chanc'd to fall upon them in a place, where I had not any *store* and *variety* of Gems to examine. But one Instance among those that occur'd to me, I shall here set down, because being so notable, it may suffice to shew, that, as to *some* Gems at least, my opinion of their having an Adventitious Gravity, and consequently Ingredient, is very probable. I had some *American Grgnats*, which I had a great and peculiar Reason to believe had been once Liquid Bodies, and therefore thought them the more worthy

thy to be examin'd ; and finding their Colour to be so deep, that they were almost opacous, and judging by my hand, that they were much heavier than pieces of Cristal of the same Bulk would be, I weigh'd them in a pair of nice Scales in the Air and in the Water, and found them, as I expected, to be almost four times as heavy as Water of the same Bulk, and consequently heavier by about a third part than pieces of Cristal, equalling them in bigness, would be. Whence so great an accession of ponderousnes proceeded, I shall tell you, when I come to my next Argument ; to which I shall advance, as soon as I have noted, that though, when colour'd Gems have a greater Gravity than Cristal, 'tis a probable Argument, that they have some Metalline Pigment or other Mineral substance mingled with them ; yet if such Gems have no such surplusage of weight, it will not follow that their Colour cannot proceed from any Mineral Tincture ; since 'tis not unreasonable to conceive, that a Mineral Substance may be present in a Liquor (such as the

Lapidescient Juice,) that we suppose
Gems to be made of, even when it adds
no manifest weight to the Body that
harbours it ; since I have observ'd (what
is odd,) That a Mineral Water, which
by its Tast, its Effects, and the Colour
it would strike, appear'd to be richly im-
pregnated with Iron, being carefully by
me examin'd Hydrostatically, did appear
very little, (if at all) sensibly heavier
than Common Water.

The *Third* and last Argument, I shall
now make use of, is taken from hence ;
That out of divers Medicinal Stones, and
ev'n out of some fine Gems, real and
Corporeal Metals, or other Mineral sub-
stances, may be extracted.

Of this Argument I shall at present
say the less, because the further prose-
cution of it will be more proper in the
Second Part of this Discourse, where
I shall be oblig'd to handle it with refe-
rence to opacous Gems, in which its
force will best appear. And therefore
I shall desire you to take notice, when
you arrive at that Part of the subsequent
Discourse, of those particulars, that
may

may serve to strengthen the newly propos'd Argument: And if it be objected, that the Bodies, there treated of, are opacous Stones, not Gems, I have these things to answer.

First, that divers Stones, that are reckon'd amongst precious ones, are opacous too; as the *Turquois*, the *Onyx*, the *Sardonix*, &c. not to mention divers others, as *Cats-Eyes*, *Opales*, &c. which are as it were Semi-opacous. Besides I much question, whether Diaphaneity be absolutely necessary to the Essence, though it be to the Beauty, of those precious Stones, wherein 'tis usually found. And I might here make it probable by discourse, that transparency and opacity oftentimes depend but upon the manner of the Pigments, dispersion thorough the stony matter of the Gem, and the convenient or inconvenient situation of the pores in reference to the beams of Light. But waiving this speculative Argument, I shall rather take notice, that several precious Stones, and even Diamonds themselves, have sometimes great clouds, which make

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make them in those parts almost (if not quite) opacous, without being thereby hinder'd from being true Diamonds or Gems, of this or that kind, to which their hardness, colour, &c. makes them appertain: And not to mention *Corne-lions*, *Agats*, and some other Stones that we may observe to be (as the tinging Corpuscles happen to be in a due or an over-great proportion mix'd with the petrescent matter, and to be Uniformly or inconveniently mingled with it,) some of them transparent and some of them semi-diaphanous; I have seen worn in a Ring a *sardomix* it self that was transparent, as unlikely a Gem as that is to be so. And as for *Granats*, though you know, that both of them are Diaphanous; yet I have had some figur'd ones, that seem'd quite opacous: and I have others by me of several Countreys, (where of one very remarkable for its large size and Geometrical shape,) that are in some places Diaphanous, but as to the main bulk of their Bodies appear at least almost as dark as ordinary Stones.

I further add, that I little doubt, but that experiments, not unlike those, I shall hereafter tell you, I try'd to obtain Mineral or Metalline substances from Load stones, native Cinaber, Blood-stones, &c. might succeed in several other of the more ponderous Gems, if it were not that the Glassy Nature, or exceeding compactness of many of them, makes the Mineral Corpuscles, that are harbour'd in the stony and insoluble parts, to be inaccessible to our *Common Menstruums*. And when the Metalline and Mineral ingredient is very abundant, and the Tincture of the stony parts not so very close, I question not, but even from transparent Gems the adventitious Ingredient may, in part at least, be dissolv'd. And to satisfie you about this matter, I shall now inform you, that having by the ponderousness of the lately mention'd kind of Granats been induc'd to conclude them impregnated with somewhat Metalline, and for that reason to think it fit to try, whether I could separate it from them, or otherwise discover it in them; I kept some of

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them (in a crucible) for a competent
time in the fire, and found, that they
had exchang'd their Colour, for one
not unlike that of unbrightned Iron; and
having reduc'd them to very fine
powder, and digested some acid Men-
struums and particularly rectifi'd Spirit
of Salt upon them, they afforded me a
rich Tincture: Encourag'd by which,
I hop'd, that, without their being pre-
viously burnt, they would in *Aqua Regis*
afford a Tincture, and accordingly
I obtain'd from crude Granats, (only
reduc'd to very fine powder) a rich Sol-
ution, which though in colour it some-
what emulated a Solution of Gold; yet
partly by the Colour of the burn'd Gra-
nats and partly by the Tast of this Sol-
ution, I suppos'd, that another Metal
was likelier than Gold to be the pre-
dominant Mineral; and having gently
evaporated part of that Menstruum, I
obtain'd from some of the rest certain
Crittals, whose shape, by reason of their
smallness and disorderly coagulation, I
could not well determin; and touching
with the Tip of my little Finger the
uncoa-

uncoagulated portion of the Liquor, this part of a drop, being put to a great many drops of the Infusion of Gall, did so immediately turn it into a substance that seem'd full as black, if not blacker than Ink, as you would, I think, have been somewhat surpriz'd to behold.

Which tryal I made to examin the conjectures I had, that one Mineral (for perhaps 'twas not the only, that help'd to constitute these Granats, was of a Martial nature ; which, if it were, I suppos'd it would, like other Bodies that participate of Iron, afford with Galls an Inky colour. I tryed also with a parcel of small and red transparent Stones, which some gheſſed to be *Granats* ; others, more probably, *Rubies*, that being finely powder'd, they would in an appropriated *Menſtruum*, (made extraordinary strong) give a Colour like that of diſſolv'd Gold. And that there were really some parts of the Gem diſſolved in the *Menſtruum*, appear'd not only by the above mentioned colour, but by these two indications : The one, that having put some of this Liquor

Liquor to some of the same solution of Galls, I just now spoke of, it produced indeed, at the very first, a dark Colour, but not neer so black as that of the *Granats*, and in a trice let fall a copious precipitate that was almost white: The other, that I was able to precipitate from it, by an urinous Spirit, a reddish substance, which being suffer'd to dry in Air, seem'd to grow into Bodies, in shape not unlike Moss, and here and there small Mushrons, all of them prettily colour'd. And from certain *Granats* that were in some places opacious, as well as in others Diaphanous, I obtain'd a Solution from whence the superfluous Liquor being abstracted, the residue, which was deeply coloured, did in the cold afford me a kind of saline concretions, which yet were not large enough to inable one to determin their Figures.

And on this occasion I hold it not unfit to intimate, that perhaps, if Men had curiosity enough to make tryals, there would be other transparent Minerals found capable of being wrought on by

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appropriated *Menstruum*s. For, I do not think, that every seemingly glassy contexture of a Mineral makes it unfit to be wrought on: For though the clear *spar*, which in most of our Western Lead-Mines in *England* is found next to the Metalline Veins, be at least Semi-diaphanous, and be of so glassy a contexture, that it usually breaks into smooth and glossy *superficies*, and looks like a *Talk*, and also for the most part is made up of and presently reducible into Geometrically figur'd Bodies, shap'd like *Rhombus*'s or *Rhomboides*; yet some other Tryals, that I have made with this *spar* inducing me to suspect, that 'twas not indeed a *Talk*, but a Body of a much more open Texture, I found, I could dissolve it in several Liquors, and particularly in good Spirit of Salt, which would presently work upon it, even whil'st it was in Lumps, and that without the assistance of Heat; which Observation may perhaps give some encouragement to such a curiosity as yours.

But by what I have said of the usefulness

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fulness of *Menstruum*s, I would not have you think, that they are the only Instruments, wherewith something Metalline may be obatin'd from some Gems: For in an other Paper of mine (to which such tryals more properly belong) you may find an account of some attempts of that kind by fusions and appropriated additaments. And however such Tryals may succeed with you that aim at *separating* from a Gem a Metalline or Mineral Body of a determinate *species*; I can teach you an easie way, whereby I have (by the help of fusion) more than once *manifested* in the General, that there may be substances, partaking of a Metalline nature, in some kinds even of transparent Gems. And partly by the same way, and partly by some others, I have been able to determin probably enough, in some cases, that the Mineral substance is predominant in it.

And here, before I dismiss the first part of our Essay, I think I may possibly somewhat illustrate our *Hypothesis*, if I briefly mention to you an experiment,

I remember I once made to that purpose. And it was this: I reduc'd to powder some of those *stiriae*, that I have often spoken of, of water petrified, as it were, spontaneously: I also consider'd with my self, that I had found Spirit of *Verdigreas*, (which I make without the tedious preparations, that *Basilius* and others prescribe, by barely distilling without additaments good French *Verdigreas*, and rectifying the obtained liquor) I had, (I say) found this *Menstruum* to be not only (as I elsewhere observe) a good solvent for many Bodies, but also to be distillable from many of them, without leaving near so much of it self behind, as other Saline Solvents are wont to do: Considering this, I say, I dissolved the stony *stiriae* in this Liquor, and having suffer'd some of it to evaporate away, and put the rest into a cool place, I obtained, as I expected, store of small but finely figur'd and transparent Cristals, that shot much after the fashion of those of the purer sort of Nitre. With some part also of the stony solution I mixed, in a convenient

An Essay about the Oxygine

nient proportion, a high colour'd solution of Copper, made likewise in Spirit of *Verdigreas*; and these two solutions being made with the same Menstruum, and warily enough put together, did not precipitate one another, but afforded me, upon the evaporation of the superfluous moisture, among divers Cristals that were transparent and colourless, some that were richly adorned with a greenish blew Tincture of the dissolved Metal. What tryals I made by this way, little varied, to imitate nature by associating into transparent Bodies stony and metalline Substances, I cannot now give you a full account of; since I neither have by me the Notes, I set down about those tryals, nor think it fit to make this first part of our Discourse more prolix, than I now perceive it to be already.

SECT.

SECT. II.

*Containing a Conjecture about
the Causes of the Virtues
of GEMS.*

What has been hitherto deliver'd in the first part of our Discourse, will, I suppose, make it allowable for me to be more succinct in the Second. I shall now therefore proceed to those other considerations, which, being assisted by what has been already said, may, I hope, suffice, to keep our conjecture about the Cause of the Virtues of Gems from seeming unreasonable.

And my first Observation shall be, that not only there is in the Earth a great number and variety of Minerals, already

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dy known by particular Names ; but
probably there are very many others
that are not yet known to us.

The former part of this proposition
will not be doubted by those, that con-
sider, how great a multitude of Metal-
line Ores, Marchasites of several sorts,
Antimonies, Tinn'd glass, Fluores,
Talks of various Kinds, Spars, Sul-
phurs, Salts, Bitumens, &c. are men-
tion'd partly by Chymists, and other
Mineralists, and partly by those that
have given us accounts of Museums and
other collections of natural Rarities ;
insomuch that of only one Kind of
Fossils, the diligence of some modern
Writers hath reckoned up between two
hundred and two hundred and fifty ;
besides Animal Stones, as *Lapis Bezoar*,
Lapis Manati, *Oculus Cancri*, *Lapis Por-*
cinus, &c.

And as for the Second Part of our
proposition or observation, you will
scarce deny it, though you consider with
me but these two things.

The first is the small and inconsidera-
ble proportion, that the perpendicular
depths,

depth, that the generality of Mines bears, to the Semidiameter of the Earth, reckon'd to be above 3500 Miles; so that, though our Globe were inhabited by some hundreds of millions of men more than now it is, and they had curiosity enough to dig Mines every where, and consequently there were Millions of inquisitive and laborious men more than really there are, their Spades and Pickaxes would, except here and there, penetrate so little a way into the Earth, that a vast multitude of Fossils might, by lying deeper in the bowels of it, continue undiscover'd.

And to this First Observation I shall subjoin this Second, that, as far as I have observed, almost every Region affords Minerals of its own, differing from those that are taken notice of in other Regions. And in particular Countries, as in some Shires of *England*, a curious and heedful Eye may, I doubt not, observe several that are not taken notice of by the inhabitants themselves, especially if well-made borers were diligently and skilfully employ'd to

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pierce the ground, and bring up Simples of divers Fossils that lye hidden under it. But having elsewhere discoursed of this matter, I shall here only tell you, in general, that in some parts of *England*, where I had more opportunity than in others, to exercise some Curiosity about Minerals, I met sometimes in a small compass of ground, with a much greater variety than I expected, and several of them undescrib'd, that I know of, by any Writer; of which sort I have received divers others from several parts both of the old world and the new.

In the next place I consider, that Nature has furnished the Earth with *Menstruums* and others Liquors of several sorts, and indowed it with divers qualities. This I have already manifested in the discourse of subterraneal Menstruums, whereto I shall therefore refer you; only taking notice in this place, that whereas water is abundantly to be met with under ground, and for the most part very copiously in Mines, by which it is capable to be variouly im-
preg-

pregnated ; this liquor it self, especially being thus alter'd, may in some cases act the part of no despicable *Menstruum*, and on some occasions otherwise concur to the production of Mineral Bodies.

I further observe, that the subterraneal Liquors, upon one account or other, (for we need not now particularly determin it) are qualified to work either as Corrosive Menstruums, or as other Solvents, upon many of the Medicinal Earths and other Minerals they meet with under ground : which Minerals, having never been exposed to our fires, have their Texture more open, and their parts more soluble than those, that have been melted by the violent heats of our furnaces.

And that even Common water will suffice to dissolve, and impregnate it self both with the Saline and oftentimes with Metalline parts, that it meets with in its passage, is obvious enough in the differing tafts and other qualities of liquors, that all pass for common water, whereof some is found better and some

H 2 worse

worse than others, to Brue, some to wash Linnen, some to Dye Scarlet, or other determinate Colours; some to temper Steel, and some for other uses.

But others unquestionably more eminent instances, are given us by the Mineral Springs, whether *Thermae* or *Acidula*, as Authors distinguish those that are actually hot, (as at *Bath*) and those that are Saline and for the most part fowrish (like those at *Tunbridge* and the *York-shire Spaw*;) of which two sorts good store are enumerated by Physicians and Geographers; and of which a far greater number would be discover'd, if men wanted neither skill nor diligence. And here I shall desire you to take notice, that, though common water do the most readily dissolve the Salts more properly so called, though not altogether pure, it meets with in the bowels of the Earth, as we see it happens in those Salt-Springs that come not from the Sea; yet there are also many others subterraneal Bodies, which upon the score of their abounding with Saline particles, will be dissolved by water,

and Virtues of GEMS. 101

water, though they be of a compounded nature, and contain very differing substances; as 'tis plain in those waters of *Hungary* and other Regions, which by the evaporation of their superfluous moisture, will yield Vitriol, a Mineral not only compounded but decompounded, as containing in it a Saline, a Sulphureous, a Metaline and an Earthly part, (which it self I have found to be none of the simplest Bodies;) every one of which may be made distinctly to appear.

Lastly, I consider, that the Petrific Juice or Spirit coming to be in a sufficient proportion mingled with these impregnated waters, so as to coagulate them, and concoagulate with them; from their coalition may result those precious Stones that we call transparent Gems. For 'tis certain, that Bodies, that were a while before in the form of waters, may coagulate into stony *stiriae*, of whose odorousness and reducibleness into lime, I have already given an account in my discourses of Lapidefcent Juices; of which you may com-

mand a sight. And that even Diamonds themselves, the hardest of Gems, were once fluid substances, the first part of this Discourse has, I hope, evinced.

To which I shall now add, that procuring some petrified Bodies to be brought me from a place in *England*, which I could not be admitted to, I found, that the Petrific Juice or Spirit, that abounded in the Earth of that spot of ground, was so penetrating, and so operative, that it made some of the vegetable substances, that were found in it, in their pristine shape, and, for ought I could perceive, bigness, hard enough to cut Glass as well as grave on Iron. And 'twas among these rarities (if I much mis-remember not) that I pick'd up a (moderately) transparent Body (which I think I have yet by me) that, by the shape and other Circumstances I judg'd to have been a diaphanous Gum, belonging to one of the pieces of petrified wood, that had been brought me, and was hardened to a degree that made it capable of scratching Glass,

And

And now to bring home these things to my present subject, I conceive, that some (at least,) of the *Real* Virtues of divers Gems may be derived from this, That whilst they were in a fluid form, (or at least not yet Hard'ned,) the Petrescent substance was mingled with some mineral solution or tincture, or with some other impregnated liquor, and that these were afterwards Concoagulated, or united and hardened, into one Gem, as a Diamond, a Saphir, a Granat, an Onyx, a Blood-stone, &c. And as divers of the Virtues of Gems may be in a general way deduc'd from the commixture of these Mineral Corpuscles; so the greatness of those Virtues and the variety of those properties in particular, may be ascribed to the peculiar nature of the impregnating liquors, to the diversity of them, and to the greater and lesser proportions, wherein they are mixt with the Petrescent juice.

To render this *conjecture* (for I propose it as no other,) thus summarily and briefly exprest, the more probable;

twill be fit to recall to mind the Arguments, whereby we have already shewn, both that Gems were once fluid or soft Bodies, and that divers of them were not simple concretions of a Petrescent liquor, but consisted also of other Mineral adventitious Corpuscles: Which may appear, partly by the separableness of such substances from some Gems; (as we exemplified in Granats) partly by the specific gravity of others, and partly by the differing tinctures (whereof one at least may well be supposed adventitious,) to be met with in Gems of the same *species*, as Rubies, Saphirs, Granats and even (the hardest stones, that we yet know of,) Diamonds themselves; of which (as is before noted) I have seen some Yellow (and that to a great degree,) some of other colours, but not so vivid, and some Green, almost like Emeraulds.

Now *since* there may be in Gems, and in some of them abundantly such adventitious Corpuscles; and *since* there is cause to think, that some may be indow-ed with divers properties and Medical Virtues;

Virtues ; since also there is a great difference among these impregnating particles and probably of a greater variety of them, than is known to us ; since lastly divers Gems are not sparingly but richly impregnated with these innobling Corpuscles , I see no sufficient reason, why some of the Virtues of divers Gems are not more likely to proceed thence, than from those unintelligible and precarious *substantial Forms*, to which they are wont to be referr'd.

But because there are some difficulties, that the objections of others or my own thoughts have suggested against our *Hypothesis* ; though I neither have time, nor do think it very necessary, to discourse amply of them : Yet to clear the way for what I am afterwards to represent, I shall (though I can but briefly do it) say something to each , that may perhaps appear no insufficient answer ; especially after I have declared , as I here do once for all, that I speak of the True and Medical Virtues that belong to Gems ; and that, as to those Magical and other Extravagant properties, that either

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either notoriously fabulous, or other
credulous Writers have made bold to
deliver, I am so far from pretending
to afford them an Explication, that
I do not allow them the least degree of
Assent.

This premis'd, let us consider the
chief difficulties themselves; among
which I doubt not but it will be object-
ed, That it is not credible, that the Mi-
neral Substances, wherewith our *Hypothe-
sis* would have Gems to be impregnated,
should have any Medical operation at all
on the human body, in regard that they
are so lock'd up that they can commu-
nicate nothing to it, especially being
indigestable and unconquerable by so
small a heat as that of the Stomach and
other parts of the Body.

But to this specious Objection I have
several things to return by way of An-
swer. And first of all; had there yet
never been any actual Tryal made,
whereby to know, whether a Gem be
capable of having any Medical Virtues,
I confess I should find probability e-
nough in the Objection to suspend my
Judgement

Judgement, till experience should determine the Question. But since upon the very credible Testimony of eminent Physicians and Patients themselves of my own acquaintance, I find much less cause to disbelieve, than to assent to some matters of Fact about the operations of Gems; and *since* such matters of Fact do strongly argue in the general, that a Precious Stone may have Medical Virtues; I think, the Objection, as 'tis propos'd in general, is sufficiently enervated by such particular instances, and ought not to keep us from believing upon Experience the possibility of the thing denied; especially since there are other things besides, that may be alledg'd in favour of our *Hypothesis*.

For it may be consider'd in the next place, that vigorous Load-stones emit copious and very plentiful *Effluvia*; and yet, besides that ordinary Magnets are usually a very hard sort of Stones, I have met with some Load-stones much harder than ordinary ones, and possibly than divers Gems. And 'tis farther

farther considerable, that there are Load-stones, (some of which I can shew you,) which do not only work upon Iron and other Magnetical Bodies, but have a manifest and inconvenient operation upon Human Bodies, by being worn in mens Pockets or long held in their Hands ; as those, that have resented such operations themselves, and observed them in others, have complain'd to me ; which I might confirm by some analogous observations, if I had time to relate them.

But now I proceed to observe, that among transparent Pebbles, some of which, you know, are by being barely well Cut and Set, made to counterfeit Diamonds, I have found several, that may be brought in a trice to emit copious and even strongly fentent streams. And if you allow the opinion of the generality of Modern Philosophers, who ascribe Electrical attractions to the *Ef-fluvia* of bodies excited by rubbing, you will, I presume, allow me to infer, that very light alterations may suffice to procure Expirations even from transparent

Gems :

Gems: Many of which are Electrical, and so are the hardest of them, Diamonds themselves; one of which I keep by me, that upon a little friction attracts, vigorously enough to be wonder'd at by the Spectators.

And as to that part of the Objection I am answering, which contends, that Gems are not to be digested or conquered by the heat of the Stomach; I will not stay to examine, whether and how far the digestion of things in the Stomach be to be ascribed to Heat, contenting my self to say at present, that, to make the Objection valid, it should be first proved, that such Bodies cannot have any operation upon the human body as pass thorough it, without any sensible change of bulk, figure, &c. as Gems that are swallowed down are supposed to do. For, we know, that some Chymists make Bullets of the *Regulus* of Antimony (which we also have made, and observ'd something odd about them) which they call *Pilulae perpetuae*, because when they have performed their operation in the Body; and

and have been ejected with the Excrements, they are by some more thrifty than cleanly persons, washed and employ'd again and again to the former purposes. Nor do we know, what Analogie there may be between some Juices in the Body, and some of the Mineral substances that impregnate Gems with their Virtues.

For, though the *Oculus mundi* be reckon'd by Classic Authors among the rare Gems, (as indeed good ones may be justly accounted Rarities;) yet if one of the best sort be but a while kept in common Water, it will, as Experience assures me, receive an alteration obvious to the Eye. I might here alledge the concurrent Authority of many, and the common Practice of most Physicians, who in their publick Dispensatories as well as private Prescriptions, ordain the Fragments of precious Stones to be taken inwardly, upon the score of the Cordial and other Virtues they ascribe to them. But I shall rather make use of less question'd Arguments, and without insisting on the manifest operation, that

that the Juices of the Body have not only on the Chalibeat preparations, where the Metal is presum'd to be open'd, but upon crude Steel it self; or urging the Examples of *Lazarus Vitri-Vorax*, or the devourers of Stones, as being rare *in non-sugario*; I shall proceed to acquaint you, that with a faint Liquor, distill'd from a Vegetable substance, as temperately qualified and as plentifully eaten as Bread, I have obtain'd, and that without Heat, from divers hard Bodies, and amongst them from a transparent sort of Gems, a manifest Tincture. And whether some Juices of the Body, assisted by the Natural Heat of it, may not, in reference to *some* Gems, serve for extracting *Menstruum*, though it may well be, more then either I or the Objectors certainly know, yet the Instance, I come from alledging, favours our *Hypothesis* more than theirs.

And even the Natural Heat of a human Stomach, nay perhaps the outward parts of the Body, may be able, though not to digest precious Stones, yet to sollicite out some of their Virtues; since I

am sure it makes a sensible alteration in the hardest sort of them. For I have a Diamond, whose Electrical faculty may be excited not only by rubbing, but, without it, by a languid degree of adventitious heat. And I have had in my keeping a Diamond, which by Water, made a little more than Luke-warm, I could bring to shine in the dark.

Object. If it be further alledged, that, though some Virtues may be conceded to Gems upon the account of the Minerals that impregnate them, yet it will be no way likely, that their Virtues should be so Various and Great, as even the modeſter ſort of Authors pretend. If this, I ſay, be alledged, I ſhall readily acknowledge, that I do not think others or my ſelf obliged to believe all the ſtrange things, that even ſome Learned Writers do ſometimes aſcribe to Gems: And if any man will think, that ſome of them are fabulous, and more of them Hyperbolical, he may ſooner find me his Associate than his Adverſary in that point. For the Rarity of transparent Gems, their Lustre, and the great Value, which

which their Scarcenes and mens Folly sets upon them, imboldens some to *say*, and inclines others to believe, that such rare and noble Productions of Nature must be endowed with proportionable, and consequently with extraordinary Qualities.

But this being freely granted, I answer to the Objection; *First*, that 'tis not improbable, that there may be in the Earth a much greater Variety of Minerals dissoluble by the subterraneal Menstruums, and capable of concoagulation with Petrescent Juices, then Authors have yet taken notice of: To which conjecture divers subterraneal productions, that I have met with, doe strongly incline me. And from the number and *various mixtures* of these may proceed not only a great Variety of operative particles in precious Stones, but a high degree of Energy in some of them.

And *next* I consider, that the Efficacy of those Mineral Tinctures or Solutions, that are already known to us and may be concoagulated with the

I Petrescent

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Petrescent Juice, may be reasonably presum'd to be much greater in some Gems, whereof they became Ingredients, whil'st they were (as Chymists speak) *in solutis principiis*, than may be expected in our Shops or Laboratories from the vulgar Solutions of the same Metals or Minerals, after they have by vehement Fires been reduced into Gold or Silver, or Lead, or Antimony, &c. For, whereas in these vehement Fusions, requisite to bring Metalline or other Ores into such substances, the volatile and spirituous parts are wont to be driven away, and the remaining Body becomes more hard and compact, and has his Virtues as it were locked up: In the state of Fluidity those subtle and efficacious parts are preserved, and united to the other Ingredients of the Gems, whence some Emanations of them may be easily enough drawn out: As in the instance I not long since mentioned, of the easie eduction of strongly fentred Steams from Pibbles so hard, that I found them more disposed to strike Fire, than Flints themselves, that are used

used in Guns. And from the greater or less plenty, and natural activity of the impregnating particles in this or that Gem, may probablly be deduced the difference in Colour of some, and in Virtue of other Stones of the same denomination: Of which we have in a Learned Writer or two, eminent Examples given us, of the great Virtue of some, and the inefficacy of other, that Experience has discovered, among those Stones that go under the Title of *Lapis Nephriticus*. For, though they be not properly transparent Gems, yet the Analogy betwixt them and those that are, seems sufficient to warrant the mentioning of them on this occasion.

And here we may subjoin two things, in favour of both the foregoing answers: the *First*, that for ought we know, the Petrescent Juices themselves may have all that is requisite to make them such, and yet have distinct Natures, and be endowed with peculiar qualities, abstracting from those which they acquire upon the score of their coalitions with adven-

See *Unzerus de Nephritide.*

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titious Liquors. This I cannot stay to
make probable by the differences I have
observed in Petrescent fluids, and there-
fore I hasten to the Second.

The next thing which I would repre-
sent, is, that having observed Petrifie
Liquors or Spirits to pervade and give a
high degree of hardness to bodies, that
chanced to lie within their reach, though
one would have thought them sufficient-
ly indispos'd to receive such an indura-
tion; I see no absurdity in supposing,
that sometimes such a Liquor may in-
vade, permeate and subdue transparent
Minerals, abounding in Saline, Sulphu-
reous, and Bituminous particles; which
consequently being duly excited, may
be made to emit their more subtile and
more active parts. And as I have cause
to think, that subterraneal Fires and
*Menstruum*s do divers times make va-
rious compositions and decompositions
in the Earth, (as 'twere not hard for
me to shew, if I had leisure;) so 'tis not
impossible, but that the Spirit, we have
been speaking of, supervening, may
mingle it self with such Bodies and pe-
trifie

trifie them together with it self into Gems. On which occasion, I remember, that I have had Salt, made by nature in the bowels of the Earth, just like that which Chymists compound by Art on the surface of it. And I have sometimes made by an easie operation and a moderate degree of Fire a certain composition of *volatile particles* of Salt and Sulphurs (some of which I have yet by me) which after distillation did in a fluid *Medium* shoot into Crystals transparent, and more curiously figured than I have seen divers natural Gems to be. So that, if either beneath or upon the surface of the Earth, such kind of substance happen to be pervaded and subdued, by a clear petrifying Liquor; we may well presume that the resulting concretions may be indued with Qualities, as well uncommon for the Kind, as considerable for the degree.

Objection. If it be yet objected, that it is very unlikely, that Gems should part with any Effluvia or portions of themselves, since they lose not of their weight, and some of them are very

little heavier than Crystal it self, and consequently are not like to have much adventitious substance to part with: I might leave the answering of one part of the Objection to Physitians and Chymists, who teach, that the Antimonial Glass and Cup imbue Wine and other Liquors with a strong emetic quality without any sensible loss of weight. But having elsewhere spoken of those things; I shall rather here demand, whether the Objectors have tryed the truth of what their Argument supposes by any way sufficiently accurate? For I much doubt, that that has neither been attempted, nor would be found easie to be performed. And till due tryal be made, let me represent, that though they will not allow common Water to be a *Menstruum* fit to draw any thing with from such a Body as Mercury, which is wont to mock the Chymists *Aqua Fortis* and *Aqua Regis*; yet both *Helmont* and others inform us, that Mercury kept for a day or two in common Water, or boiled a while in it, though it be taken out without any
fen-

sensible diminution of weight or bulk, will have imbued a considerable quantity of Water with a Virtue of killing Worms; for which purpose 'tis much used, and often with good success in a great Hospital in *London*, as the Chief Physitian of it (a very judicious and experienced man,) has more than once informed me.

And as for the lightness, that is objected against some Gems, besides that it may safely be granted, that *ceteris paribus* such may have fewer or more languid Virtues than others of the same kind; it may also be answered, that the adventitious substance that impregnates the Petrescent Juice, may be of so small specific gravity, as not to make the Gem at all heavier in *specie* than Crystal it self. For this, (as we have formerly observed,) being about two times and a half heavier than common Water of the same bulk, I have hydrostatically found, that divers Salts and some other Mineral substances are of less specific gravity; and consequently, if they were concoagulated with the Petrescent

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Juice that hardens into Crystal, need not increase the ponderousness of it, and yet may imbue it with considerable Vertues: Nor is it necessary (to add that *in transitu* on this occasion) that, not to alter even the colourlessness of Crystal or the colour of another Gem, the adventitious substance should be purely Saline: For I have divers times made Bodies, which, though transparent and colourless like Crystal, and sometimes curiously and regularly figur'd, were yet of a compounded Nature, and particularly abounded with an easily separable and strongly fentent Sulphur. But to give yet a farther and more direct answer to the Objection; I shall add, that though, when a Gem has much more specific gravity then Crystal, or will suffer an adventitious Mineral to be separated from it, 'tis a very probable Argument, that the Petrescent Juice is that Body compounded with an adventitious substance; yet it will not necessarily follow, that, when neither of these Signes appear, the Gem is quite devoid of any such substance. For,

(according

(according to what I elsewhere declare,) the Petrescent Liquor, it mainly consists of, may be impregnated not with the grosser substance, but with the finer and more spirituous part of the Mineral, without having the specific gravity sensibly increas'd. Of which I remember I shew'd a notable Instance to some curious persons, at a Mineral Spring, which many were then drinking of by the Advise of Learned Physicians for several Diseases. For though this Water both by it's Inky taste, by it's blacking the Excrements of those that drank it, and by other Signs appear'd to participate richly enough of Iron; yet the ferruginous particles, it abounded with, were so light and spirituous, that not only they would, as I tryed, be easily lost, if the Liquor were kept too negligently stopt; but when I came whilst the Spirits were yet there, (it being but newly taken from the Spring it self) to examine it hydrostatically with very good Scales and much diligence, I convinc'd the *Virtuosi* that assited, that this ferruginous Water was very little, if at all,

all, heavier *in specie* than other Water, which was brought as common Water to be compared with it, and examin'd with the same Scales and after the same manner.

And now, if you recall to mind what I have elsewhere said partly of the Atmosphers of solid Bodies, and partly of the great Efficacy of Effluviums; I hope, you will not think it absurd to conjecture, both that some precious Stones may have Medical Virtues, and that divers of these may be ascribed to the Mineral substances, whereof they participate or consist; and especially to those, which are best fitted to exert their powers by the copious Effluxions of their more agile and subtle parts.

And by this time it may be seasonable to tell you, that though, what I have hitherto discours'd do chiefly belong to transparent Gems; yet divers of the things already deliver'd may, with no great alteration, be applied to opacous Gems: of which I shall speak much more briefly, not only for the reason just now given, but because, if we have shewn

shewn (as I hope we have) that even Diaphanous Gems may be indow'd with Virtues by the Mineral substances they contain or are in part made up of ; the Arguments will hold more strongly as to opacous Gems : both because these are for the most part much less hard than the others , and because 'tis far more easie to shew by their specific gravity , and the compoundedness of divers of them, that the dark ones, than 'tis that the clear ones, may partly , and sometimes plentifully, consist of Mineral substances, imbodyed with, and hardened by Petrescent Juices or Petrific Spirits.

In favour of this Doctrine , I shall endeavour in the first place to shew, that what has been deliver'd is *possible* ; and afterwards set down some particulars to make it *very probable*.

The first part of my Task might be easily performed , or perhaps would be needless , if I were sure , you had no need to be told of any thing I have written about *Lapidescant Juices*. But for greater security I shall in this place briefly

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briefly intimate, that among the Kinds
of those Liquors, I have observed a sort
that is of so fine a substance, and yet of
so Petrifying a Virtue, that it will pe-
ntrate and petrifie Bodies of very dif-
ferring Kindes, and yet scarce, if at all,
visibly increase their bulk, or change
their shape or colour. To which pur-
pose, I remember, that I have seen di-
vers Animal and Vegetable substances
so petrified, as scarce at all to be ta-
ken notice of, by their appearance, to
have been alter'd by the operation of
the Petrescent Liquor. I have with
pleasure seen a thin Cream-Cheese
turn'd into Stone, where the Size, Shape,
and Colour even of the Wrinkles, and
the bleuish Mold (which it seems it
began to have when the Liquor invaded
it) were so well preserv'd, that an
hungry man would not have scrupled to
have fallen upon it for a good Bit. And
as for the hardness, that this Petrescent
Juice can give to the Body that it pene-
trates, I shall now only remind you of
what I lately told you: That I have had,
(and I think yet have in another place)

a pretty

a pretty quantity of Wood petrified in *England*, which retaining its former figure, and grain, and scarce at all visibly increas'd in bulk, was so very hard, that I could make Impressions with it upon Iron, and Glass it self, and make it strike Fire like an excellent Flint. To which I shall here add, that the stony parts did not suffer the Wood, which they had penetrated, to be reduced in the Fire, either to Ashes or Charcoal. And I have by me a lump of Mineral Substances, wherein a Petrescent Liquor, that fills the large intervalls between them, is transparent enough, and harder than most Stones, as far as we could guess by some tryal of it made by a skilful Ingraver of Gems.

And to these instances might be added many others, if it did not by these few sufficiently appear, that Petrifick Agents may insinuate themselves into the pores of various Bodies, and turn them into Stone, without otherwise destroying their pristine Nature, or so much as their former Figure.

Wherefore having in general shewn
our

our *Hypothesis* to be *possible*, we may now descend to four or five particular Arguments, that 'tis hoped may help to render it very *probable*. And these I shall fetch *partly* from the great specific gravity of divers opacous and medicinal Stones; *partly* from the fitness of our *Hypothesis* to render a reason of divers *Phanomena* relating thereunto, some of them scarce at all, and others much less probably to be accounted for without it; *partly* from the Metalline substances to be manifestly separated or obtained from the Stones we are treating of; and *partly* from the Nature of the Bodies whereof Medicinal Stones seem to be compounded.

Arg. I. That the specific gravity of divers opacous Stones, whereunto Medicinal properties are ascribed, is very considerable, is a Truth, which, if those that have writ ten of such concretions had been vers'd in Hydrostaticks, & had had the curiosity to examine them that way, they might have easily discover'd; as will quickly appear by particular Examples: Before the mention whereof,

of, it will be fit for me take notice to you, that considering with my self that white Marble is generally allowed to be a pure and solid Stone, and upon the score of its whiteness is likelier than most others to be free from Mineral mixtures, I thought, I might at least as well pitch upon that as on any other for the standard of the specifick gravity of opacous Stones, as they are meerly such. And accordingly having weigh'd a piece of white Marble in Air and Water, I found it to be in weight to an equal bulk of that Liquor very near $2\frac{1}{100}$ to 1, or, (that the proportion with very little error may be the better remembred,) as two and seven tenths to one. And to make trial in a Stone uncoloured, but, because harder, suppos'd to be of a closer Texture, we examin'd a fine white Pible, which we found to be to an equal magnitude of Water as two and above six Tenths to one. This being determin'd, 'twas not difficult for me to think, *both* that divers Bodies, that commonly past for *meer* Stones, are more ponderous than white Marble of the

the same bulk ; and that, if there were any such great surplusage of specific weight, as I gheft, many will be found to have above that of Marble , it might proceed from some Metalline Body , though not visibly, yet really, and perhaps plentifully mingled with the Petrefcent matter of these Stones. The later part of this Conjecture will hereafter be confirm'd in the *third Argument* ; which makes it unnecessary for me to give you now of the former more than a few instances : which I shall soon dispatch by telling you , that I quickly found by weighing the following Minerals , first in the Air and then in the Water , that a *Blood-stone* (bought at the Druggist) was in weight to Water of the same bulk as $5\frac{7}{10}$ to 1 ; The *Load-stone* , I then tried , (for all are not equally heavy *in specie*) as 4 and $\frac{6}{10}$ to 1 ; *Lapis Calaminaris* , us'd for Rheums in the Eyes , and to turn Copper into Brass , as $4\frac{7}{10}$ to one ; *Lapis Tatia* , as they call it , which is also much employ'd in Rheumatick Eyes , as very near 5 to 1 .

But

But here I must advertise you, that I have not found the proportion of each of these bodies and water to be any thing near constantly the same, but sometimes to differ very much in particular Stones of the same kind; which agrees very well with our *Hypothesis*. For, according to that, those particular Stones, that happen to partake more plentifully of Mineral substances heavier *in specie* than Stone as such needs to be, ought to be more ponderous than others of the same kind that are not so qualified: I said, heavier *in specie* than a Stone, as such need to be, because there are substances that are reckon'd among Minerals, and are capable of endowing the stony matter, wherewith they are coagulated, with Medical Virtues, and yet those substances may make the Stone or aggregate, whereof they are made, not to be heavier but lighter *in specie*. From Jet, which in some parts of Europe being found in Quarries of Mines is indeed a fossile, which is wont to be reckon'd among Stones, and by many worn as

K a Gem

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a Gem ; I obtain'd no inconsiderable proportion of oil ; and having weigh'd choice Jet it self in water , I found it to be bulk for bulk to that Liquor but as $1\frac{2}{3}$ to 1. And there are some other fossils , hard as Stone and pollishable as Marble , from which I have by distillation obtain'd two kinds of Oil, whereof one was lighter than common water ; which shews , that even bituminous and light substances may be ingredients of a Stone : And that Salts, which are most of them less heavy *in specie* than white Marble, may plentifully concurr to the making up of Stones , I shall have occasion to manifest at the close of this Discourse by those Stones , whereof we in *England* use to make *Vitriol*. The foregoing Reflection I have here touched upon , because I would intimate to you , that Stones that are lighter *in specie* than white Marble may be compounded of fossils whence they may derive peculiar Qualities , at the same time when I tell you that in my opinion such Stones as are considerably more heavy *in specie* than Marble may afford

afford us a strong presumption of their owing their gravity to the mixture of Metalline or Mineral substances. And this may suffice for our first Argument.

Arg. II. The next shall be taken from the consideration of some *Phænomena*, (relating to Medicinal Stones) which agree very well with our *Hypothesis*, and will scarcely be very well explicated without it.

And 1. As to *Transparent* Gems themselves, I have learn'd by inquiry of Travellers, that have visited those parts of the *East Indies*, where they grow, that sometimes one sort of Gems, sometimes another, and sometimes also Diamonds themselves are found included in the Rocks where they are digg'd for, or in the midst of hard loose Stones, which must be broken in pieces, to take out the Diamond or other inclosed Gem: Which *Phænomenon* will be hard to be accounted for, unless by our *Hypothesis*; according to which it may rationally be supposed, that the Gem was first formed either in Earth or some other soft and easily permeable

K 2 substance,

substance, which being afterwards per-
vaded by some Petrific juice or Spirit,
was turn'd into Rock or loose Stones, ac-
cording as the Earth and other ambient
matter chanc'd to be an intire and co-
herent mass, or divided into clods & o-
ther portions. And I remember, that the
Governour of an *American Colony*,
having sent me among other Rarities,
digg'd up in his Countrey, an odd kind
of Mineral, that seem'd more pon-
derous than at first sight it promis'd,
I had the curiosity to break it, and
found in it, here and there, several
Gems, which by their figuration and
some other circumstances were conclu-
ded to have been form'd there, be-
fore the ambient Mineral had obtain'd
the nature it then appear'd to be of.
And in *Opacious* Stones it may hence
happen, that a great lump of Medicinal
Earth may be invaded and petrified af-
ter the newly mention'd manner; so
that it may not be thought incredible,
that some of these Medicinal Stones
shou'd be very large in comparison of
others: As I remember, that an inge-
nious

nious Physician told me of a Spleen-stone, as they call them, in the hands of an acquaintance of his (where I might have seen it, if my occasions had permitted,) amounting to about four-score pound weight. And on this occasion, I also remember that even in a Medicinal Stone, much harder and heavier than Marble, and whereof I have seen lumps far greater than I could lift, I remember, I say, that having had the curiosity to cause a pretty big piece, violently broken off from the mass whereto it belong'd, to be sawn asunder, that I might consider the internal Textures, as far as 'twas visible; I found several empty Cavities of differing sizes and figures in the solid substance of the Stone, (which I think I have not yet lost:) which seems to argue, that this compact and ponderous Body was made of a stony nature by the supervening of some Petrescent Liquor or Spirit, upon porous Earth or some other consistent substance. For if it had been a meer Liquor wherein those Cavities must have been so many aerial bubbles; 'tis

not like that some of them should have such irregular shapes, and that all should have continued without emerging to the top.

2. Our *Hypothesis* will also help to render a reason of what seems exceeding difficult to be explicated; namely, How some Gems, that seem to be intire Stones, are in part of one colour, and in that, which is contiguous to it, of a quite differing: Of which sort we have the *Sardonix*, and some other opacous Gems. And I have observ'd the like, though very rarely, in dia-phanoous ones. For, according to our *Hypothesis*, it may be said, that a portion of matter, imbued with one of the Tinctures of the parti-colour'd Gem, was first form'd, and afterwards, some Petrescent Juice, endowed with another colour, came to settle contiguously to it, and so by accretion made up one Stone with it. I might illustrate this by telling you, that though Fire do make a far greater agitation of Bodies melted by it, than need be supposed in cold Petrescent Liquors, yet I have

have found in making Artificial Gems, that by some mischance or error in the operation, the Mineral pigment has richly tinged one part of the transparent mass, without at all imparting that colour to the very next part to it; so that if I should shew one of those I have yet by me, you would judge it to consist of two differing Gems subtilely glewed or fasten'd together, unless you should in vain try as others have done, to discover by the Eye or otherwise some naked commissure, which may keep those so differingly colour'd Bodies from making up one intire mass.

But let us leave these Artificial Gems, and add to what I was saying about our Natural Ones, that the Union of parts in these Resulting Stones (if I may so call them) I was speaking of before, might be the more perfect, if the supervening matter found not the first form'd Stone to have attain'd to its full induration: Though, for ought I know, even in this case, the apposition may be so close, and the two matters so near of

kin, that both may pass for one Stone, and be polish'd both together without any blemishing discontinuity of surface at those parts, where one would expect commissures. For I have by me a lump, wherein there plainly appear Stones of colours very different from each other, that were once distinct and incoherent; but by some petrescent Liquor have had all their intervals so exquisitely filled up, that neither the touch nor the Artificers Tool, the lump being now sawen asunder, discovered any Commisshires; but the whole Mass bears an uniform Polish, and is harder than divers Gems that are worn in Rings, readily enough striking Fire with a Steel. And to confirm this the more, I shall add, that in a place where a prying person of my acquaintance lighted on this portion of petrified matter, he found not only other lumps, but divers loose Stones, that seem'd altogether of the same nature with those, that by the supervention of the Petrescent Liquor were united into stony masses. I have also had a curious *Agat* so form'd, that

it

it seem'd highly probable, that the opacous parts of its matter had been some thin, but not altogether contiguous, Beds of fine Clay, or Earth, lying almost parallel to each other (but not to the *Horizon*,) which by some Petrescent Liquor, that chanc'd to settle there, was reduced to coagulate with it into a partly opacous and partly diaphanous Stone. And of such Clays or Mineral Earths, I have sometimes with pleasure observed more than one or two, which, though distinct and perhaps of differing colours, were so very thin, that the thickness of them all did scarce exceed an inch, nor did they always lie flat or horizontally, but in differing postures both in reference to the *Horizon*, and one an other, and now and then the exterior ones did successively almost surround the interior : And of these thin Couches or Layers of Earth, I remember, I have observ'd a considerable number, within a very small compass of ground. I must not in this place stay to shew, how probable 'tis, that much after the same way may be expli- cated

cated the production of divers other Gems besides *Agats*, as *Chalcedonians* and *Jaspers*, which are for the most part opacous, but oftentimes have some parts that are not so. But I am content, before I go further, to mind you on this occasion of what I elsewhere deliver, That by purposely calcining, without breaking, some of these Stones, whose greater part was diaphanous, I found, that the transparent parts turn'd white; and that some of the thin Layers or Couches of Mineral Earth had retain'd their colour as well as position, and had it much heighten'd; so that one of these Layers after calcination was of a very rich and permanent Red. And this difference of Colours I observ'd not only in Layers, but in the Specks and irregularly shap'd Clouds (if I may so call them) of other Colours (as Greenish, Blewish, &c.) I might here add, that I have found shining *Marchasites*, not only in other solid Stones, but in Marbles; as also Flints themselves, inclosed in great masses of Marble, and likewise

likewise Wood ; in strong Stones imploy'd to build a Wall , and Shells (at least as was judg'd by their shapes and sizes;) in a great mass of Stone that I met with almost on the top of a Hill remote from the Sea , together with divers other such *Phænomena* , which I think may probably be accounted for by our *Hypothesis* and scarce without it. But being willing to dispatch this Discourse, and unwilling to intrench upon the Discourse of the *Effects of the Petrefient Juice* , (to which the consideration of these and divers other *Phænomena* , to be met with about the Generation of Stones and petrified Bodies, especially in Wombs or Molds , more properly belongs;) I shall in this place only point back to one *Observation* , and answer one *Objection* ; because both of them are pertinent to our present Discourse.

The *Observation* is this : That even in transparent Gems , and which is more , of the self same *species* , I have sometimes taken notice of such an Aggregation or Accretion of Stones to one another , as argues their having been

been produc'd at several times. For proof of this, I need no more than ^{Page, 76,} ~~77, & 78.~~ ferr you to what I have not ^{76,} long since, related about those *Cornish* Diamonds, wherein sometimes a lesser Stone, though Geometrically shap'd, was found in good part inclos'd in a greater, as well as in part also extant above it. Whence I argued, that the production of this aggregate of two Crystalline Bodies was not made all at once, but successively, and that the lesser was first form'd, which I shall now confirm by this Consideration. That if the greater Stone had been first harden'd, the matter of the lesser must only have exteriorly stuck to it, and been as it were impos'd upon it; but could not have made it self in the substance of the greater a Bed or Mold, especially of such a Geometrical figure as it self had not yet received.

And though this successive Generation of the parts of (seemingly) intire Gems may appear to you somewhat new and strange, yet that its fitness and requisiteness to explain the foregoing

Phanomena

Phænomena and others, to be hereafter mentioned, may the more recommend it to you; I shall add, that perhaps you may be assisted to conceive, if not invited to admit it by a Mechanical illustration. For we see in divers Chymical Solutions, as of Salts and other Bodies, that there are certain stages or periods of coagulation; so that, when such a quantity of the superfluous moisture is exhal'd, especially upon any considerable refrigeration or other favourable circumstance, those particles that are most dispos'd to coagulation will convene and shoot into Crystals, after which no more will do so, till a farther and more considerable evaporation of the water or other *Menstruum* be made; upon which will ensue a new Crystallization of the parts. And I can shew you the productions of a metalline, but uncommon Solution, that I so made in an appropriated Liquor, that the first shooting afforded me a Layer or Bed of curiously figur'd Crystals, and the following, another Layer of fine Crystalline Bodies, that have fasten'd themselves to

to the former, but differ notably from them both in shape and posture. And in this Experiment, the dissolv'd Body was but one, as the *menstruum* but one ; but if there be a diversity of nature in the Liquors that make up a *menstruum*, or in the Bodies that are dissolved in it ; some of the Corpuscles may convene either a part with those of the same Nature, or mingled with those of a differing Nature ; but yet at the same time and so make up Crystals of a compounded Nature, and some of them may convene with homogeneous particles, but at differing times ; and so miss of such uniformity as might else appear in their concretions. Which may be illustrated by what I have elsewhere related concerning the Crystallizations of Salt-Peter and Sea-Salt, dissolv'd together in ordinary water ; where most commonly grains of Salt of resulting figures are produc'd ; and also a considerable part of the Sea-salt coagulates in the form of imperfect Cubes about the bottom, before the nitrous Corpuscles shoot into Crystals of their

own

own (almost prismatical) shape. And I might further add, that it matters not, whether the superfluous water be wasted by Exhalation, or by being drained by a body fit to soak it up; as we have had occasion to observe in accelerating the Crystallization of some Bodies, where I was not willing to employ the heat of the fire, by placing, underneath the Solution, dry'd Earth, or some other porous and soaking body.

With some Analogy to such instances as these, we may conceive, that where there are Petrescent Liquors, mingled with common water, there may, by divers accidents, and particularly an hot Summer, a sufficient discharge be made of the superfluous moisture, to make the more disposed parts of the Petrescent Liquor to coagulate, and afterwards the coagulation may be suspended, either by the supervening of a colder season, as Winter; or even in Summer it self, by a plentiful rain, or the effect of it, a Land-flood, which might check the progress of coalitions by overmuch diluteing the Liquor, that might

might else have turn'd into Stone. Not to mention, that trial hath assured me, that there are Bodies, and those of very differing kinds, which will in tract of time, especially if their coalition be further'd by cold weather, coagulate, after they have long remained in a fluidform, though the water or other *menstruum*, by being inclos'd in stopt Glasses, be kept from wasting. And since the Earth harbors differing kinds of these Liquors (as I have elsewhere shewn) and divers of them may be copiously impregnated, some of them with one sort of Mineral, and some with another; we may conceive, that they may have distinct periods for their respective coalitions, and yet may stick close to one another; in regard that, though in our Chymical Crystallizations the Artists are wont to take out of the vessel what shoots the first time, before they make a fresh exhalation of the water for a new Crystallization, and by this means have the coagulated Bodies, that they obtain at one time, more uniformly shap'd; yet in the hollow Receptacles, that the

Earth

Earth affords to Petrescent Liquors, the Vessels continuing the same from first to last, the Uniformity of the Bodies produc'd by coalitions made at several times must be less regular, and the *manifest* accretions or aggregates of coalescent Bodies must in all likelihood be more frequent. And accordingly having suffer'd the exhaling of some Liquors to be continued in the same Vessel, I had coalitions of very differing Bodies at the bottom.

What I was not long since saying, makes me remember, that in order to a satisfaction (which the Event gave me) of the conjectures I had about the successive concretions of some solid Firestones, that were not suspected to be other than intire and uniform masses, I caus'd two or three that I thought likely and of very different sizes and shapes, and brought from distant places, to be warily broken: Which Tryal gave me the pleasure of observing, that the internal Texture of the least of these Minerals, which was almost spherical, was very differing from that of the more

L internal

internal part of the substance of the Stone. And that in the other and greatest Mineral there was a little globulous Stone, that manifestly was not of the same piece with the invironing mass, differing from it not only in Texture, but here and there by a discernable Commissure: though in most places their Adhæsion was so strict, that we could not make any separation of the two Minerals by the help of this Commissure. The greatest part of this double Fire-stone I keep by me, and shall say nothing of what I further observ'd in it, having mention'd what I said already but upon the by.

I might add, that in some Circumstances, even in those Vessels, and therefore without any manifest exhalation of the water or other *Menstruum*, and sometimes where the dissolv'd Body was homogeneous, I have in process of time had coagulations, where the last form'd Crystals seem'd plainly to have been generated by way of accretion to the first.

Difficu'ty. Having now done with
my

my *Observation*, I shall endeavour to clear a grand Difficulty, which I foresee may be *objected* against our *Hypothesis*, namely, That these *Aggenerations* (if I may so call them) of Medicinal and other Stones are sometimes found in places, where there are no petrifying Springs, and perhaps no Springs or other Waters at all, nay little or nothing but Quarries or other masses of Stone.

But to this I answer, *First*, that if we admit of the Relations, that I elsewhere mention out of approved Authors concerning Men and Beasts turn'd into Stone by a petrifying Spirit, that suddenly invaded them, it will not be absolutely necessary that there should be any Petrescent Springs or other like water to produce such Minerals, as we are now discoursing of.

Secondly, for ought has yet been shewn to the contrary, we may suppose that Rain-water does sometimes bring along with it such petrifying particles as may serve our turn. In confirmation whereof I shall add, that having of a learned and judicious person inquired

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after divers particulars relating to a famous Bath, by him visited in *Hungary*, whose Water abounds very much with Petrescent particles, over which there is very high Building erected, I learn'd by his answers, among other remarkable things, that to the Roof or upper part of this tall Structure there were fastened many long stony concretions, (like those wont to be employ'd to adorn *Groto's* ;) which he affirmed to be from time to time generated there, not, as I at first suspected, by the dashing up of any drops of water ; (which he averr'd could not reach any thing near so high,) but by the copious petrific steams, that being there checked in their ascent, did, according to their natural propensity, coagulate into Stone. Whether this Relation may warrant me to guess, that in some places Stones may be generated, without the help either of Rain or Springs, by the ascent of Petrific particles in the form of exhalations from some lower parts of the Earth ; which exhalations, suffering the lighter steams that accompanied them to exhale, may operate

operate upon some disposed materials that they find in their way, and turn them into Stone: whether, I say, this narrative may well suggest this conjecture, I shall not now stay to examine, though the Earthy and sometimes Sulphureous sediments that have been observ'd at the bottom of Rain waters, suffer'd to settle in clean vessels, may seem to favour it; and though also I might illustrate it by what I observ'd in a Bottle of distill'd Liquor, whereof no part would naturally ascend in a dry form: for having kept this Viol well stop'd in a safe and quiet place for a year or two, I observ'd that the ascending steams had quite pervaded the Cork, and had formed at the top of it numerous whitish *stiriae*, slender, but of a length that surprized me.

Thirdly, there is no necessitie, that in all soils, where petrific waters are to be met with, there should be petrifying Springs, at least above ground. For I have caused to be digg'd store of figur'd and transparent Stones in a certain Earth, that lay upon the upper part

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of a Rock, and seem'd to be a very dry
Soil : Perhaps you will allow me to
tell you, that I have by pouring a solution
of stony *stiriae*, made with Spirit of
Verdigrease, on a convenient quantitie
of *Bolus Armenus*, and suffering the
soft mixture to remain in a Glass in the
open Air, till the superfluous moisture
was exhal'd; I have, I say, by this means
imitated in a little, what I have been
now relating, and found small but un-
ting'd and figur'd Crystals dispersed
through the little Cavities of the Red
Earth. But 'twill be more considerable
to our present purpse to add, that the
fairest and hardest petrifying Wood, that
I ever had or tryed, was taken up by an
Ingenious person I employed in a Plot
of Sandy ground, where he could not
find any petrifying or so much as any
other Spring. To which I know not
whether I should add, that supposing
the ground to have been once moisten-
ed with a Lapidescient Liquor, whether
brought thither by Springs, or any other
way; one may in our *Hypothesis* well
enough account for this difficult *Pheno-*

menon,

menon, that now and then, not only in the surface of the ground, and perhaps upon Rocks themselves there are found Aggregates of figur'd Stones, that seem to grow upwards, as it were from a Root; which much puzzle men to know how they came there, and may incline them to their opinion, who ascribe Vegetations to Stones. But to this may be answered, that many of the Concretions, we are speaking of, may have been formed in wombs that lay, though not deep, yet under ground, or in shallow cavities in the surface of it, and that, after their formation, the looser Earth that surrounded them, may have been washed off by Rains, blown off by Winds, or otherwise remov'd, leaving behind them these Stones that adher'd firmly to a solid Body. Besides, if I had time, I think it were very possible for me to shew, that stony Concretions might be produc'd by the Mechanical action of the Air upon the stony particles that successively apply themselves to the matter, that first begins to coagulate, when they are ready

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to be forsaken by the moisture that accompanied those particles, and was necessary to their due application to the casual rudiments (which pass for Roots) in imitation whereof I have more than once obtained both from saline and stony Solutions, dry tufts of prettily figur'd, and diaphanous or white, but very slender, *stirie*, (if I may so call them) that seemed to grow out of the solid Glass, and made men wonder how they came thither, no Water or other Liquor appearing near them.

Fourthly, It may very well happen, that the Petrescent Liquor may be so mingled and dilated with ordinary water, as not to be distinguished from it by the generality of men, nor to be capable of disclosing it self by its effects, till either by the copious exhalation of the common water, or by some peculiar advantages, it has to operate upon Bodies, it has opportunity to discover it self. On which occasion I shall add, that there is a Lake in the North of *Ireland*, wherein I could never hear but that Fishes lived as well as in other Lakes,

Lakes, and yet there are some Rocks near the bottom of it, to which there fasten themselves divers masses and other pieces of a finely figured substance, and transparent as Crystal; of which an eminent person, the chief Owner of the Lake, presented me with some, and promised me more. Now if we suppose, that either by Springs of Petrific water, or by Rains, or by subterraneal steams, or otherwise, waters, resting in any hollow place, though upon the top of Rocks and Mountains, shall be sufficiently impregnated with Petrific particles; and that afterwards in process of time the meerly aqueous parts shall be, by degrees, by the heat of the Sun, the soaking of the grounds, the winds, or the continual action of the Air, brought to exhale away in the form of Vapors, the Petrific particles, which are not so volatile, will turn the Soil beneath them and on the sides of them, as far as the Sphere of their activity reaches, into Stone harder or softer, of this or that kind, according to the particular nature of the Petrific

trescent Liquors, and the Structure and other dispositions of the Soil they invade: In which Soil, if there chance to be lodged Bodies heterogeneous to it, whether vegetable substances, as Roots, pieces of Wood, Gums, &c. or the whole Bodies of Animals, as Toads, Frogs, Serpents, Fishes, &c. or their parts, as Shells, Bones, &c. or Minerals of an open Texture, as Boles, unripe Ores; or else Gems or Stones of another kind already form'd; any of these things or any other that shall chance to be lodged there, must be found either petrified or inclosed in Stone, when this changed and hardened Soil shall come to be broken up. Nor is it at all necessary, that this petrefaction of the extraneous Bodies, and of the Soil or Bed, be made at once: For, it may well be made successively at several times, according as some parts of the Petrescent Juice happen to be more copious and penetrant, and consequently more fit to be soaked in further than other. For, as the porousnes happens to be greater in one part of the Soil than

than in another ; or as the Texture and disposition of particular Bodies, lodged in the Earth, gives advantage to the Petrific particles to work on some of them sooner, or in a differing manner than in others ; so the Induration of the pervaded matters may be very unequally made in point of time , as well as in other circumstances. So that (to omit many other things explicable by it) we may, from what hath been already deliver'd , conceive, how it may happen, that Medical Stones of very differing Colours, Consistencies , and Operations (of which I have several by me , that I had from the same Mineral mass,) may be generated and seem intire Bodies, though (as in some that I found,) the difference is so great, that one part of the Medical Stone is dark, heavy, and opacous, and the other much lighter, transparent, and quite otherwise colour'd. And upon the same Principle may be explained , what I lately mentioned to you about the finding of Diamonds inclosed in loose Stones and even in Rocks ; of which we have credible

Testimony,

Testimony : which seems not more strange to me than a Stone, which I have by me, which being a kind of Pible, contains in it a perfectly shap'd Serpent, coild up, but without a head, which appears to have been formed before the Stone, in regard that in the upper and lower parts of the solid Stone there are cavities left, which together make up one Cavitie, just of the size and shape of the contained body ; to which as it was easie for the matter of the Stone, whilst 'twas yet a soft body, to accommodate it self exactly ; so 'tis scarce conceivable, how, if the Pible had been first form'd, the inclosed *animal*, if it were one, or the matter whereof the seeming animal afterwards was formed, should not only get in, but find a cavity so curiously shap'd and so fitted to its bulk. And that this variety was produced at several times, might be further argued from this, that the seeming Serpent is plainly of another and clearer kind of Stone than that of the Mold, that incompassess it ; and of the Mold it self, one part, contiguous to the included

included body, is whitish, and abounds in shining grains or flakes ; in both which, it differs from the other and far greater part. And now it will be time to hasten to the

Fifth consideration, which is, that for ought we know, in those very places, where now there is nothing to be seen but loose Stones, and perhaps beds of Stone themselves, that in those very places (I say) there may in times past have been Petrescent Liquors, whether stagnant or running. For, I * elsewhere shew, (to an other purpose) that Earthquakes, Inundations of Seas and Rivers, sinkings of ground, incroachments of the Land on the Water, fiery Eruptions and other such Accidents, (some related by Authentick Authors, and others happening in our own times, in places, some of which I had the curiositie to see,) have among other odd effects been able to dry or choak up Pools and Lakes, and to stop and quite divert the course not only of Springs, but

* In an *Examen* of an Experiment urged for the Magnetism of the Earth.

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but of Rivers, so as to leave no foot-
steps of them, where they plentifully
flow'd before. Upon the score of
which transpositions of notable quanti-
ties of terrestrial matter and other
great changes of the structure and dis-
position of the Soil in divers places, it
may well be suspected, that the stony
Wombs or Molds, wherein the above
mentioned Bodies were found, were
heretofore at sometime or other, of a
muddy or earthy Nature, and were re-
ceptacles of Petrescent Liquors, which
at several times turn'd the whole mass
of the Soil into Stone, before the Springs
or other Waters, containing the Petri-
fic Liquors or Spirits, were quite con-
sumed, or had their course altogether
diverted. But though I could say much
more to confirm and apply this, and
the preceding considerations; yet ha-
ving spent so much of my time already,
I shall not only leave all that unsaid,
but, to make some amends for having
staid so long in clearing this difficulty,
I shall do little more than name the two
remaining Arguments.

Arg. III.

Arg. III. It agrees very well with what we were formerly saying (in the first Argument) about the great specific gravity of such as the newly mention'd Stones, in comparison of that of white Marble or transparent Pibles, that it should be possible, out of those Minerals to extract some of that substance, whether Metalline or of kin to it, upon whose account I told you I supposed them to be so ponderous. And accordingly we have by appropriated *Menstruums* obtained, from the forementioned Bodies, (and not from those only,) Solutions or Tinctures, which, besides that, by their colour or taste, they discover themselves, did, upon their being dropt upon a Solution of Galls or some other convenient Liquor, or upon their being examin'd by other proper ways, produce such changes of colour or such determinate *Phænomena*, as argued them to abound with Metalline or Mineral particles, (which, for the most part of them I observ'd to be of a Vitriolate nature;) so I found, that the Solution of a *Blood-stone*, which tasted

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taſted very rough upon the Tongue,
wou'd with the infusion of Galls make
an Inky mixture; and the like wou'd
also be made with Load-stone, Emery,
Marchasites, &c. open'd with corrosive
Menſtruum. But the Solution of *Lapis*
Calaminaris, which was of a golden
colour, did not operate like the rest on
the infusion of Galls; but yet by its
taſt, as well as colour, ſufficiently
discovered it ſelf to have copiouſly
impregnated the *Menſtruum*. And
now the mention of *Lapis Calaminaris*
minds me to take thence an instance of
what I lately intimated, that there
may be other ways, beſides that of
diſſolutions in proper *Menſtruum*,
to ſhew, that ſome Medicinal Stones
participate of Metalline and Mineral
ſubſtances. For it is by melting *Lapis*
Calaminaris with Copper, and keeping
them together for a competent while
in fusion, that Brass is made; wherein
the red colour of the Copper is changed
into a golden one, and the absolute
weight (for I ſpeak not of the ſpecific
gravity) conſiderably increased. Nor

is this the only Mineral Stone, from which I have, by a way quite differing from those I have yet mentioned, namely with running Mercury, obtained a Metalline substance. And though native *Cinaber*, used by eminent Physicians both inwardly and outwardly, be looked upon by the Vulgar as only a red Stone; yet 'tis known, in the Quick-Silver Mines of *Friuli*, and some other places where it abounds, that it is a Mercurial Ore, whence by vehement fires they distill running Mercury, which we by moderate ones have sometimes done.

But here perhaps it may not be improper to tell you, that though, before any admonition given men of the expediency of examining stones Hydrostatically, I could not receive from others, yet I made against my self the following Objection, That there are some Stones, to which useful Qualities are ascribed, which are either not at all heavier *in specie* than is requisite for a Stone, as such, to be; or so little heavier, that 'tis no way likely, that Metals or any

M such

such ponderous Minerals should contribute either to their Productions or their Virtues.

In answer whereunto I thought it may be said in the first place, that our *Hypothesis* does no way oblige us to deny, that there may be such Stones. For though it ascribes the Virtues of most Gems and Metalline Stones to the metalline and ponderous Mineral substances they partake of, yet the concession agrees very well with our Doctrine; which, (as will in the Fourth Argument be more manifested) speaks in general, when it teaches, that the Virtues of Stones may, in many cases, depend upon their consisting not of a pure petrescent substance, but a substance impregnated with other Minerals, which, though most commonly they prove specifically heavier than the Petrescent matter, as such, without being the less, but rather in some cases the more operative and communicative of their Virtues; yet in divers stony concretions, the adventitious ingredients may be specifically lighter than the genuine matter of the Stone,

Stone; as may be easily gathered from some passages of the foregoing Discourse. For, not here to urge, that divers Bodies, that pass for Stones, do abound in particles of Salt, which may be much less heavy than pure Stone of the like bulk, I have observ'd, that some other hard Fossils abound with a kind of *Bitumen*, which, when by distillation brought to an Oyl, is much less heavie than a Stone of the same bulk. And, as I remember, I have had some portions of such Oil, that would swim even upon common water: and lest this should be ascribed to the subtilization, the *Bitumen* received from the fire; I will add, that, having Hydrostatically weighed a piece of good *Asphaltum*, we found it to be to water of the same bulk, but as 1 and somewhat less than $\frac{4}{5}$ to 1. Which was within a Tenth of the proportion to water of a stony, though a bituminous, Fossile, commonly call'd in *England* Scotch-Coal. And because Sulphur as well as *Bitumen*, is very apt, (and indeed more apt than before tryal I expected)

by even a moderate heat or attrition to diffuse its steams , (usually ranck fentend enough ;) I shall add , that there are Variety of hard Stones , which abound in *Sulphur* : (witness that in some places they obtain their common *Brimstone* by sublimation thence) and yet having weigh'd a Role of *Brimstone* in Fire and Water , I found it to be but a fraction scarce worth mentioning above double its weight to the Liquor ; which shews it to be much lighter *in specie* than *Crystal* it self.

An improvement of this first Answer may furnish me with the second. For hence we may argue , that 'tis not impossible , that the principal virtue of a light Medical Stone should be due to some mixture of a Metalline or the like ponderous substance ; since , if some of the ingredients , that are plentifully mix'd with the true stony matter , be of the lighter sort , though there be also some Metalline or other heavie Mineral particles mingled with the same matter , yet the specific Levity of the one , in comparison of this matter , may compensate

pensate the specific Gravity of the other, and they may all compose a Stone, either less, or not more, ponderous than white Marble. On which occasion, I remember, not only that I found a blackish *East-Indian Flint*, and likewise a Black *English* one, to have to water not full the proportion of $2 \frac{1}{2}$ to one, but that one of the first pieces of black Marble that I examin'd Hydrostatically, was found, notwithstanding the darkness of its colour, to be to water of the same bulk scarce any thing more than $2 \frac{1}{2}$ to 1. which you may remember was the proportion I found between white Marble & water, unless we should say, that this blackness of colour proceeded, not so much from any gross Bituminous matter, imbodyed with that of the Stone, but from some Mineral smoak that had pervaded it. And this puts me in mind of speaking something in this place about what might properly enough have been discoursed of long ago.

Wherefore I shall subjoin in the Third place, that it seems not impossible,

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that the matter which Medical Stones are made of, may, before it comes to be hardened, derive various colours and be imbued with Virtues by subterraneal Exhalations and other steams. This I fear you will think somewhat strange, and therefore I shall briefly endeavour to confirm it by the mention of two or three particulars.

That then many places of the lower part of the Earth emit copious exhalations into the upper, and even into the Air it self; I presume you will grant, and I have elsewhere proved it. That also such subterraneal steams will easily mingle with Liquors, and imbue them with their own Qualities, may be inferr'd from the Experiment of mixing the *Gas*, (as the *Helmontians* call it) or the scarce coagulable fumes of kindled and extinguished Brimstone, with Wine, which is thereby long preserved. And I have elsewhere mentioned, how I have incorporated this Smoak with other Liquors, wherein I observed its operations to be notable.

That beneath the surface of the Earth

Earth there may be sulphureous and other steams, that may be plentifully mix'd with water, and there in likelihood with Lapidescient Liquors, I have also manifested in another * Discourse.

* Of Subterraneal Steams.

That Quick-silver may be in part resolved into Fumes by less fires than many of those that burn under ground, will be readily acknowledged by Chymists and Gilders, and is obvious in the Fumigations employed in the Cure of the *Lues Venerea*. And that Mercury may in the bowels of the Earth be so disguised, and well mixed with stony matter, as to suffer the whole concretion to pass for Stone, may be observed in some kind of native Cinaber.

That Sal Armoniac, of which in some places there is to be dug up store, will, with a moderate fire, be made to ascend in form of exhalations, is vulgarly known, as to the factitious Salt of that name, and I have found it to hold in the native. That common Sal Armoniac, Sulphur, Mercury and Tin will be sublimed into a Gold-like substance, that

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participates of most, if not of all the Ingredients, may appear by the account I have elsewhere given of the way, I us'd in making *Aurum Musicum*: And that even Gold it self, the heaviest and fixest of the bodies we know, may by no great proportion of Additament, and that with but a moderate fire, be made to ascend in the form of Fumes or even of Flame, I have several times tryed, by wayes elsewhere deliver'd. And that Mineral Exhalations may be met with in the bowels of the Earth, is witnessed by the Relations of divers Credible persons, conversant about *Minerals*, that affirm themselves to testifie what they write upon their own Observation to which; some things that I had seen my self did the more. incline me to give credit. And this copious ascension of Mineral fumes and even of Metalline ones, may be much confirmed not only by what is written by professed Chymists, but by the Learned and curious *Johannes Kentmannus*, who, in the useful Catalogue of the *Misnian Fossils* he had collected, amongst the *Pyritæ* or fire-

fire-stones, reckons one, whose title is *Pumicosus*, & ab exhalatione ardenti nigro colore tinctus; and another, whose inscription is *Coloris argenti, qui ab exhalatione virosa colore cinereo est tinctus*. The same may be further confirmed by what I have some where met with as related in terminis by the Learned *Cabæus*, that he found in the Territory of Modena.

To bring this home to our purpose, since there are Mineral Exhalations of very differing kinds, dispersed in divers places under ground, and since there are several volatile Minerals, as Arsenic, Orpiment, Sandarach, &c. that are very actively hurtful; there may be others indow'd with Medicinal Qualities, and the Exhalations of such Minerals, either alone or mix'd with Petrescent Liquors, pervading duly disposed Earths and Bolusses, and other fluid, soft, or open substances, before their induration, may endow them with Medicinal and other Qualities.

Nay, when I recall to mind the old *Phænomena* that I have partly observed, and partly received from credible testimony, about

about the coalitions, mixtures, tinctures, and the emanations, as 'twere, of those Tinctures, in metalline, stony, and other fossile concretions; I dare not peremptorily deny, but that, even after subterraneal bodies have obtained a considerable degree of induration, and perhaps great enough to make them pass for stony ones, there may be subterraneal steams subtle enough to penetrate, tinge, and otherwise impregnate them. Which you would think the less impossible, if you reflect upon what I just now related out of *Kentman*; and especially if I had time to add here, what I remember, I elsewhere deliver about my tryals to tinge native Crystal with differing colours by the fumes of volatile Minerals. And that a very small proportion of a Metalline substance, resolved into minute particles, may suffice to impart a tincture to a greater quantity of other matter duly disposed, may appear by those factitious Gems, wherein with three or four grains of a skilfully calcin'd Metal, or some such Mineral pigment, we may give the colour of a natural

natural Gem to a whole Ounce or more of vitrified matter. And I remember, that in subtler fluids, I have made the instance by vast odds more conspicuous, having ting'd with one grain or less of a prepared Metal (as Gold or Copper) as much successively generated phlegm, as, if it could have been all preserved, would have amounted to a bulky lump of deeply coloured matter.

But your allowing the hesitancy I have expressed in this last Paragraph, is not necessary to my present purpose; wherefore I shall not borrow any thing to countenance it from another Paper, but pass on to what remains.

Arg. IV. The *last* thing, that I shall represent to shew, that the Virtues of opacous Gems and Medicinal stones may be more easily, than those of transparent ones, accounted for in our *Hypothesis*, is this, That the main Ingredients, whereof many such opacous Stones consist, were complete Mineral bodies before they became Stones; *some* of them having been Medicinal Bolusses, or the like Earths; *some*, Earths abounding with

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with Metalline or Mineral Juices; *some*,
Ores of Metals, or Minerals of kin to,
Metals; and *some, in fine*, Bodies of other
sorts or natures differing from these and
one an other. For, all these several kinds
of fossils may, by the supervening and
pervasion of Petrific Spirits, be turn'd
into Stone, and consequently retain
many of the Virtues, they were indow-
ed with by the Mineral Corpuscles,
that had copiously, either under the
form of Liquors, or Exhalations, im-
pregnated them, whilst they were yet
Earths, or other bodies of a more open
or Penetrable Texture.

I might illustrate this by the way I
elsewhere mention, whereby I made such
mixtures even of Stony and Metalline
Ingredients, that notwithstanding their
coalition were transparent, though you
will grant that to be more difficult, than
to compound such concretions when
one is allowed to make them opacous.

But here I must obviate an objection,
which I foresee may be made against
our present Fourth Argument, unto
which even what I have been now say-
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ing may afford a rise. For since it seems by our Doctrine, that Gems may be but *Magisteries*, and consequently but such compositions, as though made in the bowels of the Earth, might be made or imitated by humane skill, it may seem very improbable to many, that bodies so near of kin to Artificial ones, should be endowed with such peculiar and some of them with such strange Virtues as are ascribed to divers Gems, and are thought to be capable of flowing only from certain Substantial forms and those very noble ones too.

To this I might reply, that I admit not any such imaginary Beings as the Peripatetic Forms, which I fear they will never be able to demonstrate. But to avoid unnecessary disputes, I will rather answer in short, that such compositions as are call'd Artificial, may, for all that, be indow'd with great Virtues, and such as are call'd Specific; witness the Virtues of many Chymical Preparations, even of those that are used by Physitians of all sorts. And lest you should think, I need to fly to Chymistry

Chymistry, of which some Learned Men are pleased to have a great distaste, I will name a couple of instances out of *Galen* himself; The one is the Ashes of Crafish, to which, notwithstanding the destruction that has been made of the pristine Body by fire, he gives a greater commendation against the, as strange, as fatal poyson infus'd by the biting of a mad Dog, than he does either to the Fish it self unburn'd, or to any medicine of Natures own providing; and I hope you will grant a Virtue of that kind and degree to be specific enough. My other Instance shall be taken from Treacle, which though allowedly a factitious body, and consisting of I know not how many Ingredients shuffled together, was yet in the dayes of *Galen* (to whom a Book is attributed about it) and ever since has been the famousest Antidote in these parts of the world, and has been celebrated not only for its Alexipharmacal Virtues, which alone are sufficient to intitle it to specific ones, but for divers others which are generally ascribed to it, some indeed

indeed upon the score of Manifest, but others also upon that of Occult Qualities:

The objection being thus dispatch'd, we may return to our Medicinal Stones, about which I shall venture to add, that according to our way of Explicating the production of them, a not impossible Solution may be offer'd of this difficult *Phænomenon*. That sometimes Stones, that are thought without scruple to be of the same kind (as hath been particularly observed

by Learned men of the *Lapis Nephriticus*) are of

See *Unzerus de Nephrit.*

such different qualifications, that some of them prove very considerable Remedies in cases where others prove almost utterly ineffectual. And I have observ'd also, though very rarely, that a Medical Stone may have Virtues, that are taught to be the properties of Stones of another kind. For, according to our *Hypothesis*, when the stony matter is impregnated as it ought to be with those Minerals, that in the ordinary course of nature belong to that *species*, its

its Virtue will be such as it should be for kind, but for degree may be very various, answerable to the plenty, purity, subtlety, &c. of the Mineral that impregnates it. But if the stony matter chance to be inbued with some other substance of a contrary nature, though perhaps the proportion of it may be so small, and the colour of it such, as not to make an alteration in the Stone obvious to sense, and great enough to make it judged to be of an other *species*; yet it may so vitiate the matter wherein its expected Quality resides, or check and infringe its operations, as not to leave the Stone any considerable degree of Virtue. And on the other side, if it happen that the Mineral Corpuscles, that are wont to impart a certain Virtue to the stony matter of one Gem, should, by some lucky hit, be so united with that of an other sort of Gems (of which case I formerly gave an Instance in green Diamonds,) though the quantity of this unusual Ingredient may be but very small, yet, if it's efficacy be great,
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it may innoble the Stone with a notable degree of some such Virtue, as is supposed not to belong to that *Species*, but to an other.

And on this occasion I shall add, that I know a Gentleman (a professed Scholar) who to the Eye seems to be of a Complexion extraordinarily Sanguin : This person was for a long time so troubled with excessive bleedings at the Nose, that, notwithstanding all the Remedies he could procure in an Academy of Physick, where he lived, he was divers times brought to Death's door, till at length his Case growing very famous, there was sent him by an antient Gentlewoman a Blood-stone, about the bigness of a Pigeons Egg, with an assurance that it had done scarce credible Cures in his Disease, by being worn about the Patients Neck. Upon the use of this Stone he quickly recovered his Health, and had long enjoyed it when I convers'd with him, but yet so, that when he left it off any considerable time, his distemper would return. And when I seem'd to suspect

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that imagination might have an interest in the efficacy of this Remedy, he answer'd, that he was very well satisfied of the negative; and particularly upon this tryal, that he had, by the hands of a third person that liv'd not far off, and whom he nam'd to me, stop'd a Hæmorroie in a neighbouring Gentlewoman, whom the violence of the Distemper kept from knowing that any thing had been applyed to her, till a pretty while after the Blood was stanched. I shall not here mention other Instances, though very remarkable, of the efficacy of this Stone, which I had both from the Gentleman himself, and an intimate Friend of his, who is a very Learned Man and a Physitian; because I have said enough to make it seasonable for me to tell you, that notwithstanding all the odd operations of this Stone, when I came to look upon it, 'twas so differing in Colour and Texture from what I expected, that I should have taken it much rather for a Gem of some other *species* than a Blood-stone.

To confirm some of the Particulars

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comprized in this our Fourth Argument, and shew the variety and sometimes great plenty of Mineral and other subterraneal matters, that may concur to the composition of Bodies that pass for Stones; I shall observe, that the subtily and penetrancy of some Liquors, if duly consider'd, may evince it to be possible, that such Bodies should be petrified by them and with them, as may in part consist of Animal and Vegetable substances, as in petrified Skulls, Bones, and pieces of wood: And we see, that soft Stone, which is plentifully found near Naples, and commonly call'd the *Lapis Lyneurius*, being rubb'd a little and moistened with water, and then expos'd to the Sun in a due season of the year, will, in a very short time, (as Eye-witnesses have assured me,) produce Mushrooms fit to be eaten; as if even the seminal Principles and Rudiments of Vegetables may be so preserved in a petrified Earth, as to be able to disclose themselves when they find an opportunity. To which agrees well, what an eminent person,

Master of some of these Stones, informs me, *That they now and then find them of a vast bigness*, as if whole masses of Earth, pregnant with the prolific Principles of Mushrooms, were, by some supervening but not very potently hardening Petrefient Liquor, turn'd into Stone.

And not only there may be *Bolsusses*, seal'd Earths, and such like fossils, that are commonly known to be Medicinal, harden'd into Stone by petrifying Agents; but also other Earths, subject to be petrified, may have Medicinal and subtle particles of such a kind in them, as scarce any body would expect. But to omit Instances, belonging to another Paper, I have visited a certain Clay-pit in a vast piece of ground, in which at a considerable depth from the surface of the Earth there lay a bed of Clay, which by distillation yielded some acquaintances of mine a Salt so volatile and strong, and so differing from other subterraneal Salts, that my Examens did not discover the manifest qualities of it without some wonder; and the owners of it (persons curious and

and rich) did themselves use it as well as give it in Physic, and cryed it up for an excellent Cordial, and a great opening and Diaphoretic Medicine.

That sublimable Salts, Sulphurs, Bitumens, (Bodies that communicate enough of their Virtues,) may be met with in the bowels of the Earth; I have elsewhere shewn: And that such substances may be found in bodies that pass for Stones, I have been induced to think by the Chymical Examen, that I purposely made of some such concretions, particularly of that solid and heavie one, that is commonly call'd *Scotch-Coal*, from whence I obtained by distillation, (wherein I somewhat wonder'd, other mens Curiosity did not, as far as I knew, prevent me;) a good proportion of Oil or liquid *Bitumen*, and no small number of Saline particles that seem'd to be of an uncommon nature.

That Metalline particles may concur to make up a Body, that passes for a Medicinal Stone, may appear by native Sulphur which is it self a compounded body, besides a good

a good proportion of Mineral Earth.

I had thoughts not to make an end of this Discourse, without mentioning to you some attempts, that I partly design'd, and partly made, to illustrate some passages of it by purposely contriv'd Experiments, whereof some were unprosperously and others not altogether unsuccessfully try'd. But not having the Minutes of them by me, and not daring to trust my single memory in Experiments so nice, and so long since made, as those were, I shall here put an end to your trouble, especially since at length I perceive, that the forgetfulness of my first intended brevity has misled me so far beyond the bounds of it into Excursions, whereinto the unforeseen connexion of things unawar's engag'd me, that I stand in need both of your pardon and my own: Of *yours*, for having exercis'd your Patience with a prolix Discourse; and of *my own*, for having receded from my Custome, by contributing to that prolixity, and by expatiating upon Conjectures; to which, the more I conform

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to my own Practise, the less I am indulgent: Though these may be the more pardonable, because I have proposed them but as Guesses, not peremptory Assertions, much less Physical Demonstrations. And if Aristotle himself, where he gives an account of *Phænomena* appearing above the surface of the Earth, scrupled not to think, he had done enough, if he had shewn, how such things *may be* produc'd; I hope, it may be tolerable in me, who treat of things, that Nature does privately in her dark and subterraneal Recesses, to have offer'd Accounts, that are possible, if not probable. And yet I should have spent much less of my Discourse upon Conjectures, if I had not seen, that they gave me Rises to bring in more of Natural History, than I could else decently do. But after all this I confess to you, (though you may think it a Paradox) that one of the main causes of the Prolixity of these Papers was my Hast, and that Experience hath taught me, on this Occasion (as well as on some others) that

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that there may be more Truth than there
is Likelihood in the gentile Concept of
a *French Secretary*, that said, He had
written his Friend a long Letter, be-
cause he had not Leisure to write him
a short One.

F I N I S.



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